

NGM.COM SEPTEMBER 2010

NATIONAL GEOGRAPHIC



KING TUT'S DNA *Unlocking Family Secrets*

A FABLED AUSSIE ISLAND

MADAGASCAR'S PIERCED HEART

DAZZLING INSECT EGGS

THE MYSTERY OF EELS

NATIONAL GEOGRAPHIC

VOL. 218 • NO. 3

September 2010

Cover Story

Tut's Family Secrets

DNA sheds new light on the boy king's life and death.

INTERACTIVE SLIDESHOW

Sidebar

Royal Incest

The ultimate taboo had risks—and rewards.

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September 2010 | Features



▲
Sands of Time

Australia's Fraser Island

Madagascar's Pierced Heart

Forces of greed are pillaging native rosewood.





MORE 

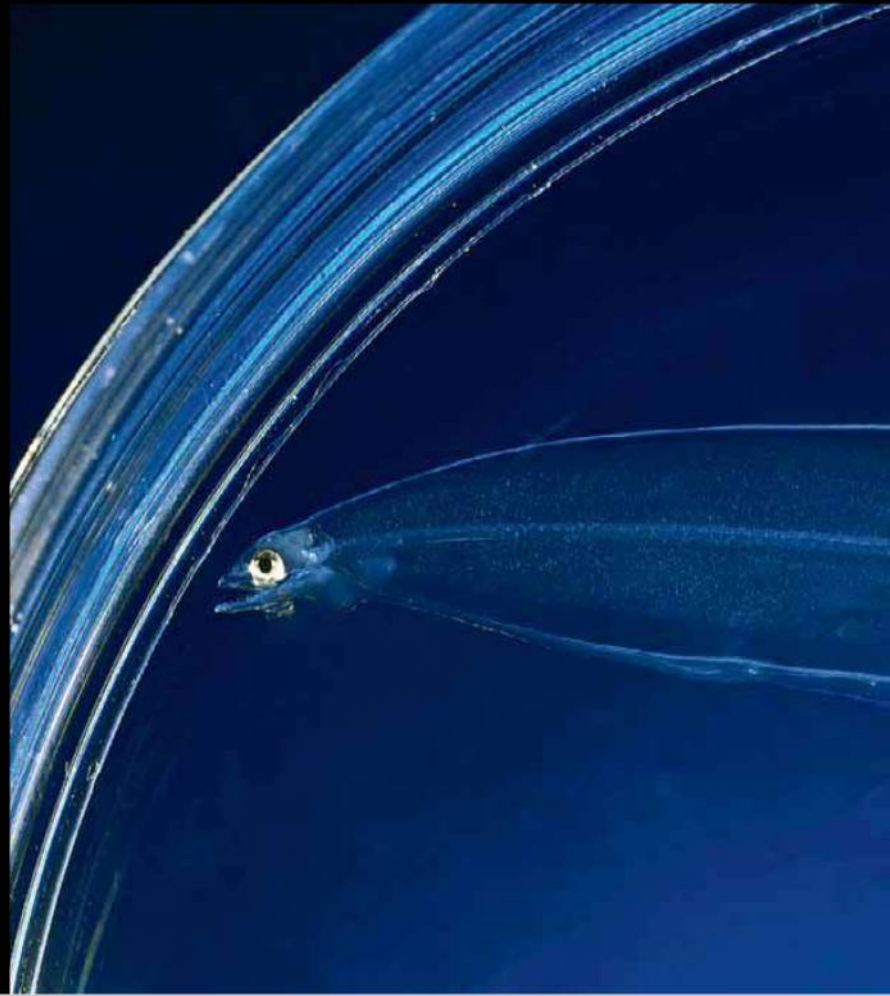
Insect Eggs

VIDEO



Mysterious Travelers

Eels writhe in rivers and spawn in secret.





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NGS Explorers

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For its close-up, King Tut's 24-pound, gold burial mask was given a 90-minute reprieve from its glass case at Cairo's Egyptian Museum.

Photo by Kenneth Garrett



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Found at Ground Zero

A doll, a shoe, and Bible pages are among the artifacts destined for the 9/11 museum.

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Cilantro or Soap?

Your brain—and perhaps your genes—may determine if you find the herb tasty or sudsy.

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PHOTO: PASCAL MAITRE (MADAGASCAR)



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Shot from Philippe Mathieu's helicopter, rice terraces surround the village of Andina in Madagascar.

PHOTO: PASCAL MAITRE

As photographers in the field, we think we know the landscape. Then we step into a helicopter, and suddenly the terrain unfurls before us. Philippe Mathieu, the helicopter pilot who worked with Pascal Maitre on this month's Madagascar story, was a photographer's dream. "He never said, 'I can't do this.' It was always, 'Let's try,'" Pascal told me. Philippe knew how photographers think. He understood about waiting hours for a few minutes of perfect light. With Philippe's help, Pascal shot aerials of the Madagascar landscape and showed, in ways that could never be comprehended from the ground, the scarification of the land caused by mining and logging.

Philippe was a pro. But even the most careful pilot can be on the wrong side of a set of statistics. On April 11, just weeks after Pascal had left Madagascar, something went wrong—as yet no one knows what—and Philippe's chopper went down. He was 38 years old.

His mother and sister were visiting him in Madagascar at the time. Afterward, they waited for days to bring his coffin back to France, because ash from the Iceland volcano canceled all flights. "With Philippe I never worried about anything except the photographs," Pascal said. "We were a team."

A handwritten signature in black ink, appearing to read "Pascal Maitre". The signature is stylized and fluid, with a horizontal line extending from the end.

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A handwritten signature in black ink, appearing to read "Chris Jones". The signature is stylized with a large, sweeping initial "C" and a long horizontal line extending across the middle of the name.

Mount St. Helens

Your update on Mount St. Helens's recovery heightened old memories. Shortly after the first eruption in 1980, a colleague and I flew along the skirts of the mountain, looking down on rows of huge, downed trees laid out in military order like so many toothpicks. Then came ranks of still standing trees: green on one side and the other, charred, facing the mountain. A year later, accompanying a group of forestry-school deans, we flew by helicopter into the crater, still steaming with the smell of brimstone. Yet on the nearby slopes the rejuvenation had begun. Spots of green were emerging from the ash, and files of elk made their way across the blackened landscape.

JAMES M. MONTGOMERY
Atlanta, Georgia

As European transportation remains crippled from the effects of the Eyjafjallajökull volcano, I commend you on your luck/foresight in having the May issue arrive at my house this week. Two hundred square miles of destroyed forest at Mount St. Helens is impressive, but a fourth day (and counting) of a continent full of grounded air traffic seems equally so. I imagine that volcanoes, earthquakes, tsunamis, hurricanes, floods, and whatever else are not really more frequent than usual, but they do help us remember humility when we begin to get full of ourselves.

LONNIE HANAUER

(Touch Text button to read more.)



May 2010

I was struck by the tragic yet logical way in which the Mexican mafia runs its affairs. Its members have no option for protection nor chance of a future. Facing certain death, they carve out a life and religion of their own.

Corrections, Clarifications

May 2010:

The Secrets of Sleep
Page 80: William Dement, dean of sleep studies at Stanford University, was incorrectly described as retired.

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EDITORS' CHOICE **Mariajoseph Johnbasco** Neyveli, India
In India, hanging saris can double as rockers for toddlers. Johnbasco, 48, was visiting his mentor in Pondicherry when he noticed the man's granddaughter asleep in this colorfully cascading crib.



Selections from our editors





Selections from our editors





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Barbados Several species of swimmers—human tourists, protected turtles, assorted fish—share the waters of Paynes Bay. Boat operators here feed fish-strip breakfasts to about 15 young hawksbill and green turtles.

PHOTO: CHARLIE HAMILTON JAMES



of swimmers—human tourists, protected turtles, assorted fish—share the waters
ors here feed fish-strip breakfasts to about 15 young hawksbill and green turtles.

PHOTO: CHARLIE HAMILTON JAMES



United States Seen from a satellite, the 2,600-acre “boneyard”—a 64-year-old depot at Davis-Monthan Air Force Base, in Tucson, Arizona—looks like parchment lined with toy planes. The site stores some 4,000 aircraft.

SATELLITE IMAGE: GEOEYE



old depot at Davis-Monthan Air Force
e stores some 4,000 aircraft.

SATELLITE IMAGE: GEOEYE



England Membranous wings spanning two feet and head tucked out of sight, an adult male Egyptian fruit bat negotiates netting in a London studio. This nocturnal fruit-eater was the living subject of an anatomical study.

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PHOTO: TIM FLACH



ht, an adult male Egyptian fruit bat
ng subject of an anatomical study.

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PHOTO: TIM FLACH



Found at Ground Zero If every object tells a story, the ones displayed here speak of thousands with a common ending: a Georgia man whose wife slipped him a love note **1** for his trip to New York City; a woman with prayer beads **2** at work on the 98th floor of the World Trade Center; a husband who always carried a two-dollar bill **3** to remind him how lucky he was to have met his second wife.

Collected for the National September 11 Memorial & Museum, the objects tell of love, faith (Bible pages fused to metal **4**), lifestyles (a Mercedes key **5** and a golf ball **6**), and a workday (computer keyboard **7**) that came to a tragic end in 2001. The museum, set to open in September 2012, has some 3,000 artifacts so far, hundreds of them bestowed by relatives of those who perished.

A ladies' shoe **8** is one of several objects here that belong to survivors. The four-inch heels carried their owner down 62 floors, away from the crumbling south tower, and across the Manhattan Bridge to safety. —Luna Shyr



Learn the stories behind these items from the National September 11 Memorial & Museum.



PHOTOS: IRA BLOCK
SOURCE: NATIONAL SEPTEMBER 11 MEMORIAL & MUSEUM




Recovered artifacts bear witness to lives and buildings lost on September 11, 2001.

Recovered artifacts bear witness to lives and buildings lost on September 11, 2001.



DING





Herbaceous Debate Cilantro is one polarizing herb. The seemingly innocuous staple of Mexican, Asian, and Indian cuisines has become a fresh ingredient in news stories and inspired passion-fueled blogs. Fans liken its notes to those of citrus; haters say they smack of soap. Whichever side of the produce aisle you're on, solidarity abounds.

Yet it isn't simply a matter of taste. According to Charles Wysocki of the Monell Chemical Sense Center, it's actually about flavor, which the brain perceives based on a complex combination of taste, smell, heat, texture. In the case of cilantro, Wysocki has a hunch that genes play a role too. His ongoing study of twins shows that identical ones have the same reaction to it far more often than fraternal ones do.

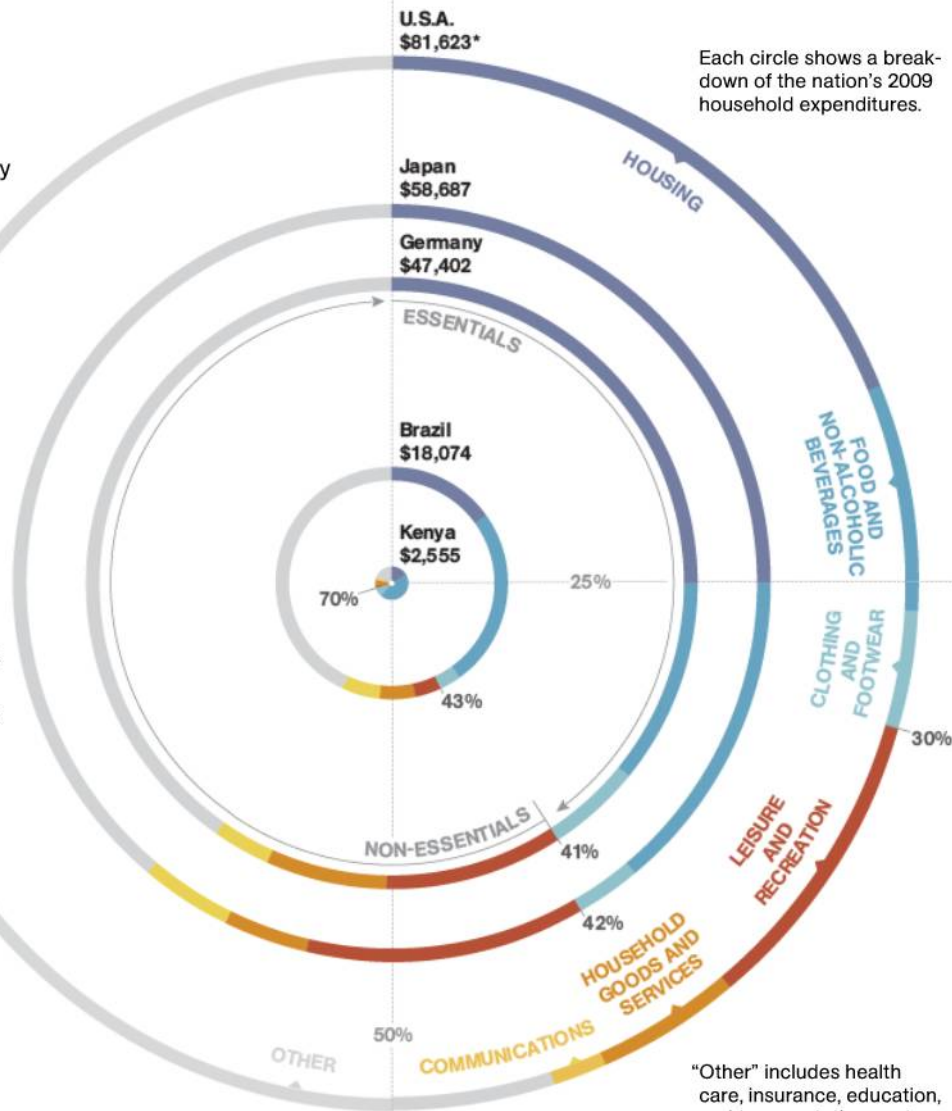
The genetic verdict is still out, but one thing is certain: In California, where annual records are carefully kept, cilantro production has doubled in the past decade. Agricultural economist Gary Lucier says Americans are eating on average at least a third of a pound of it a year, likely due to our increasingly diverse culinary scene.

Does that taste like victory, or work you into a lather? —*Catherine Barker*

Costs of Living “Gain may be temporary and uncertain,” Ben Franklin presciently said, but “expense is constant and certain.” The current financial crisis has pared the wealth of developed nations, but housing, food, and clothing remain the staples of spending patterns everywhere. In 2009 households in rich countries spent proportionately less on such vitals than their counterparts in emerging or developing states.

Today economists are keeping an eye on young markets like China, where savings rates run high and spending is likely to increase as wages rise and growth leans less on exports. They’re also looking at the fast-growing category of communications. “Mobile phones,” says U.K.-based market analyst Media Eghbal, “are now driving spending and becoming ‘essential’ items.” By 2020 they could be ubiquitous—meaning time, at least, may be spent the same everywhere. —*Jeremy Berlin*

Each circle shows a breakdown of the nation’s 2009 household expenditures.



*TOTAL CONSUMER SPENDING DIVIDED BY NUMBER OF HOUSEHOLDS; KENYA DATA EXTRAPOLATED FROM PREVIOUS YEARS GRAPHIC: MOLLIE BATES. SOURCE: EUROMONITOR INTERNATIONAL

“Other” includes health care, insurance, education, and transportation costs.

U.S.A.
\$81,623*

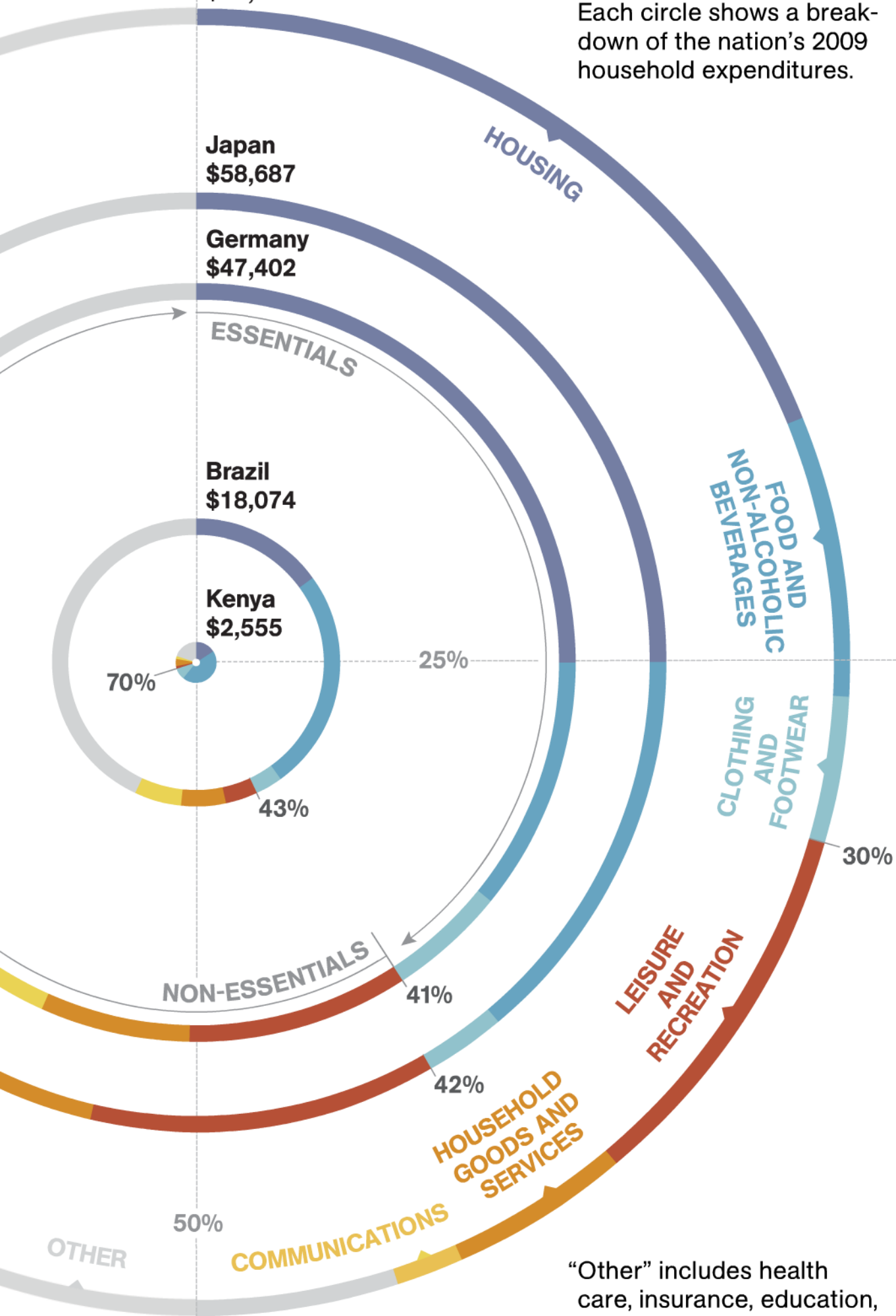
Each circle shows a breakdown of the nation's 2009 household expenditures.

Japan
\$58,687

Germany
\$47,402

Brazil
\$18,074

Kenya
\$2,555



"Other" includes health care, insurance, education, and transportation costs.

Crawly Cuisine Don't bug out, but the UN's Food and Agriculture Organization is working on a policy to promote insects as food worldwide. Turns out beetles, crickets, and many other types are rather nutritious. A serving of small grasshoppers, for instance, packs nearly the same protein punch as ground beef. And insects can be farmed more cheaply and on much less land. At least a thousand species are already part of the human diet: Mexicans liquefy stinkbugs for sauces, Thais deep-fry giant water bugs, and Australian Aborigines chew ants that have a lemony flavor.

As the global population nears seven billion, the FAO sees insect farming as a move toward food security—a subject for its upcoming conference on entomophagy, the practice of insect eating. Getting skittish diners in the West to swallow the idea poses the biggest challenge, says entomologist Gene DeFoliart, who has a penchant for termites. "It's time to take this seriously," he says. Once we do, a fly in your soup could come with the chef's compliments. —Jennifer S. Holland

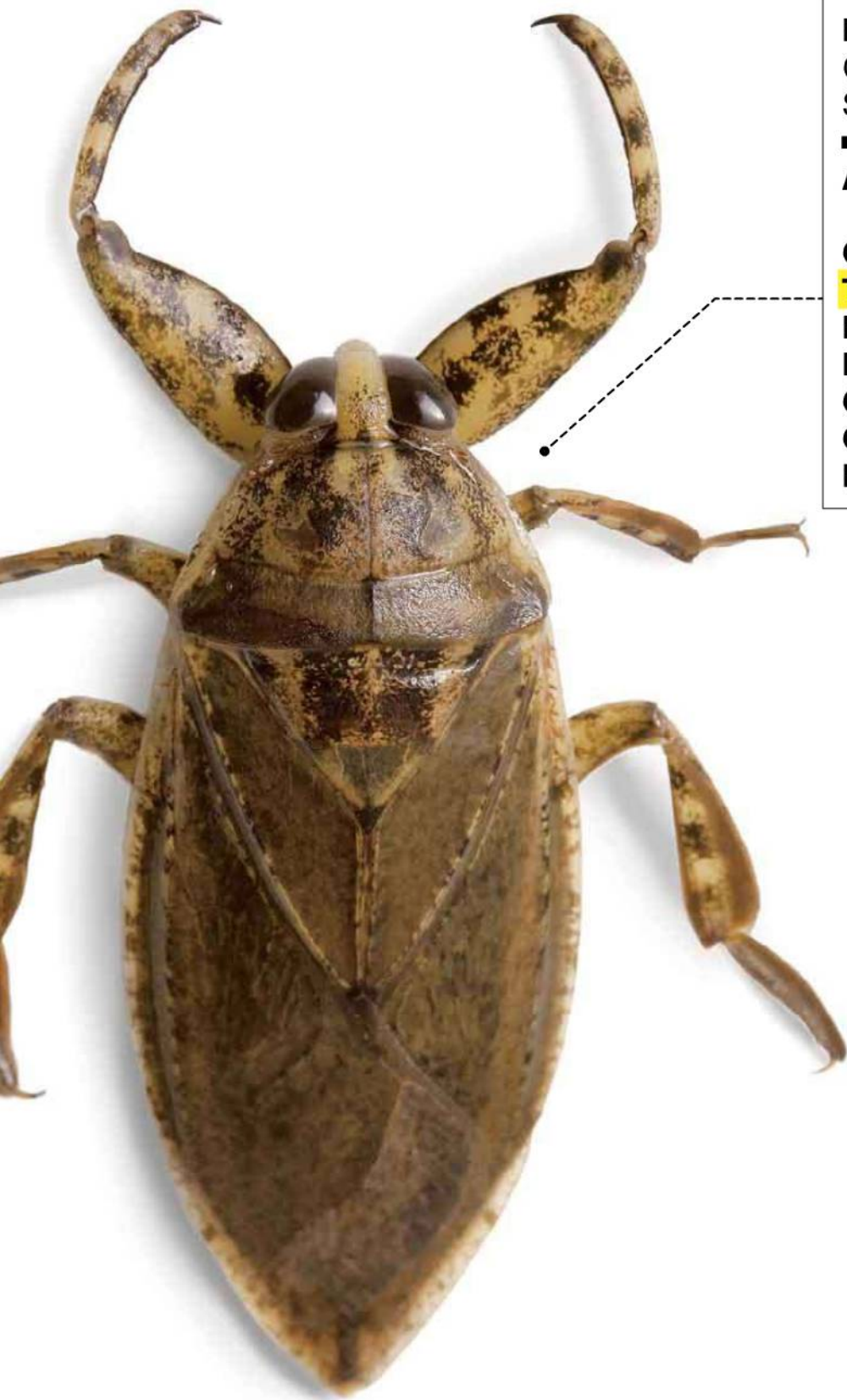


Nutrition Facts	
Giant water bugs	
Serving size: 100g	
Amount Per Serving	
Calories	62
Total Fat	8.3g
Phosphorus	226mg
Iron	14mg
Calcium	44mg
Carbohydrate	2.1g
Protein	19.8g



Find the nutritional content of more bugs.





Nutrition Facts

Giant water bugs
Serving size: 100g

Amount Per Serving

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Iron 14mg

Calcium 44mg

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Protein 19.8g



The Truth About Dreams You have a very strange dream. Where did it come from, and what does it mean? Then you think you wake up...but how do you know you're not still dreaming?

These questions have long been a topic of hot debate. Just ask Sigmund Freud, who believed that dreams are our brain's way of saying: These are my wishes! Or Allan Hobson, the Harvard professor of psychiatry, who theorized that dreams are our attempt to make sense of random neuron firings during sleep. Or maybe the ancient Hindus were right: Life is but a dream.

Now Hollywood is presenting its own dream theory. In the hit movie *Inception* (above), a character tries to enter another character's dreams and plant an idea. Various ideas about dreams are in the mix: Dreams within dreams, dreams that seem to start in the middle of the action rather than at the beginning, and dreams that are influenced by external stimuli—stuff in the real world, such as an Edith Piaf record.

To find out the truth about dreaming, we interviewed Robert Stickgold, director of the Center for Sleep and Cognition at Harvard, ([Touch Text button to read more.](#))



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To find out the truth about dreaming, we interviewed Robert Stickgold, director of the Center for Sleep and Cognition at Harvard,

An Explosive Wager

Never mind the World Cup or Super Bowl. With a bevy of volcanoes in various states of agitation, a Dublin bookie offers the chance to cash in on the ones that blow.

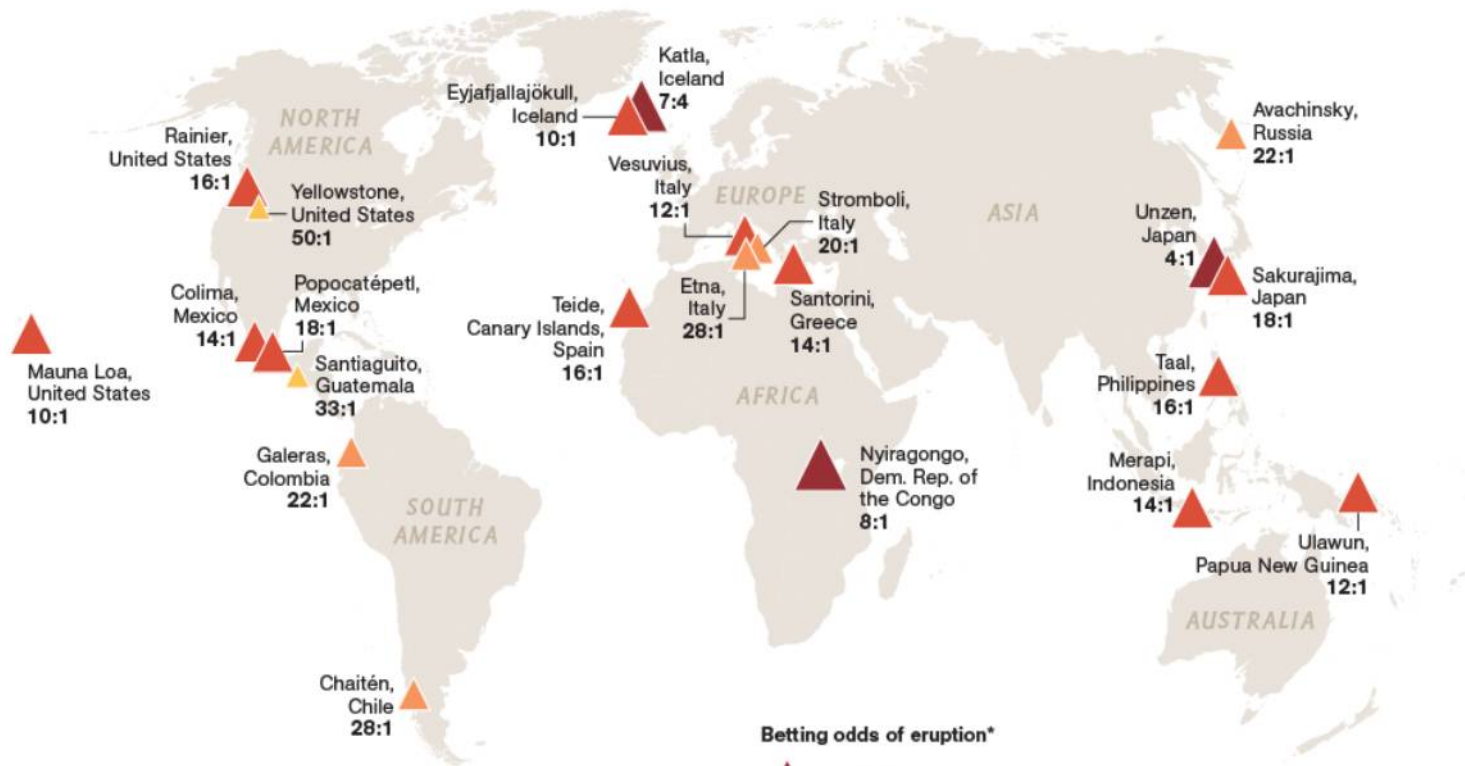


Eyjafjallajökull volcano

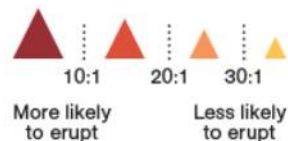
It's an investment even more volatile than stocks: the next big volcanic eruption. Well before Iceland's Eyjafjallajökull blew this year, Ireland's largest bookie, Paddy Power, was letting punters bet on the peak they deemed most likely to explode. The seven-to-four favorite? Another Icelandic peak, Katla. Eyjafjallajökull now sits in fourth place, along with Hawaii's Mauna Loa (ten to one). Unlikely to go off, but with a big purse if it does: Yellowstone (50 to one).

"Volcanoes with regular lava flows or burps are hot favorites," says Paddy Power spokesman Darren Haines. "Dormant volcanoes can see odds as low as 500 to one." Probabilities are calculated using the Volcanic Explosivity Index—the scale, ranging from zero (nonexplosive) to eight (megacolossal), that scientists use to rank eruption severity. The first volcano to hit level three, with plumes at least two miles high, will prompt payouts.

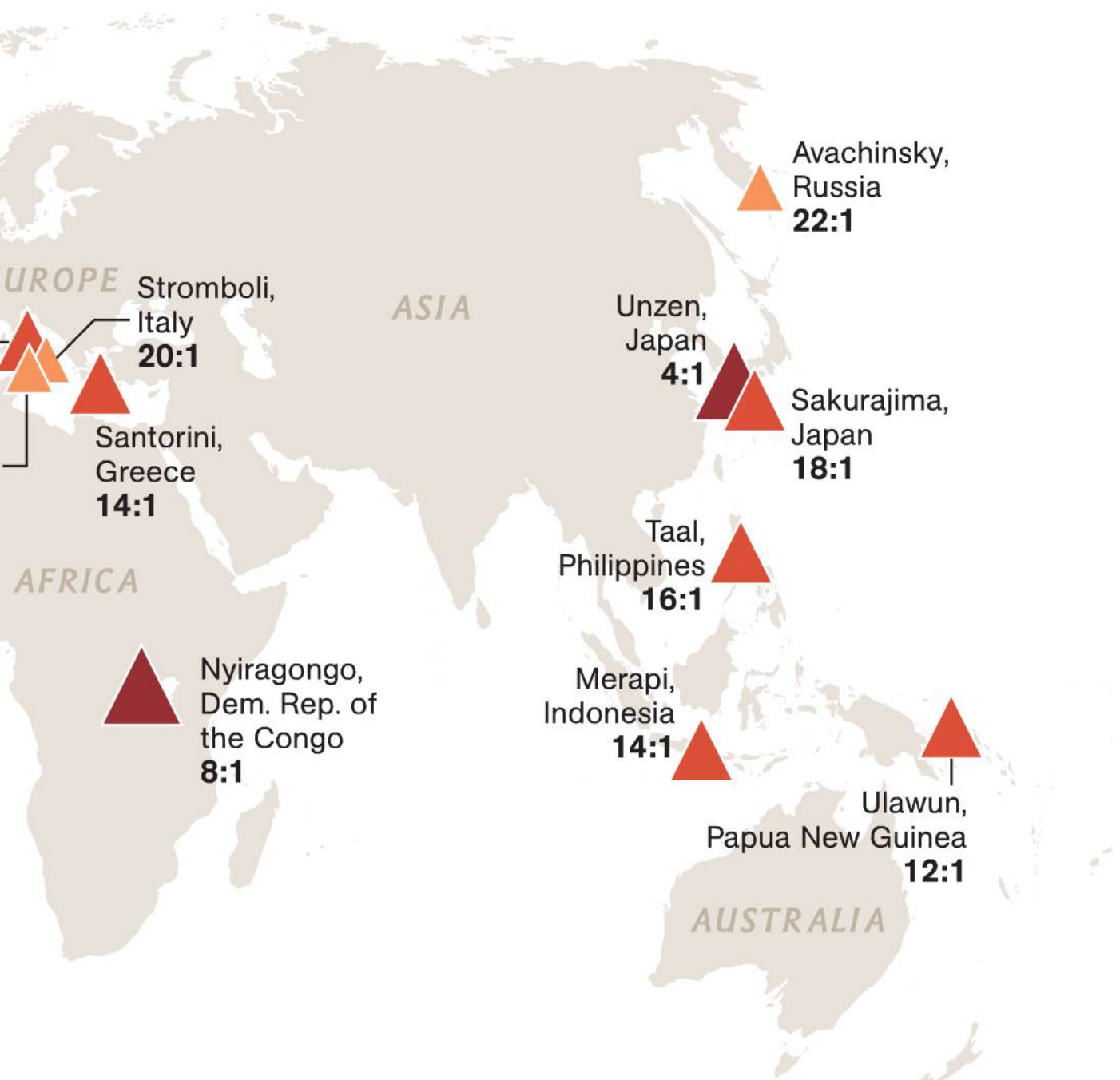
Paddy Power's clients came up with the novel market after the 2009 eruption of the Philippines' Mount Mayon. If natural phenomena aren't your thing, this year's bets have also included the next Oscar winners, pope, and James Bond actor—and which country will make first contact with space aliens. (Ireland and the United States were top picks.) On a more somber note, one could have wagered on how many wild polar bears will exist as of the end of 2011 and how many species will be critically endangered. Here's hoping the odds land in the animals' favor. —Jennifer S. Holland



Betting odds of eruption*



*A 10:1 bet pays €10 for every €1 wagered. Odds are as of June 2010.

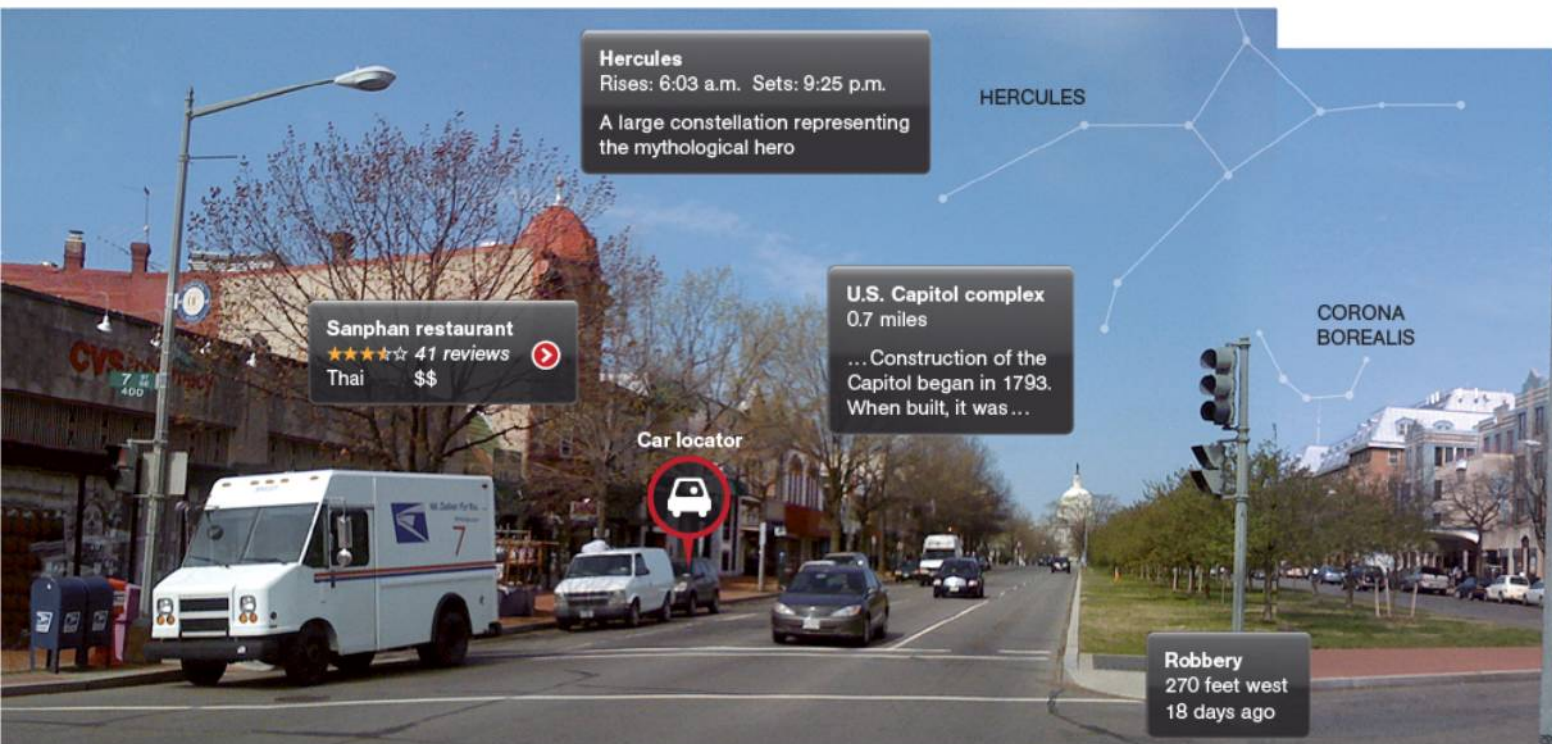


Betting odds of eruption*



More likely to erupt

Less likely to erupt



Revealed World

Imagine bubbles floating before your eyes, filled with info about stuff you see on the street. Science fiction? Nope. It's augmented reality. And one day it'll be as routine as browsing the Web.

In March one of our staff designers enhanced the reality of his Washington, D.C., neighborhood. Smart phone applications (apps) added layers of information to what he saw—called out in this composite of five photos, each taken with his phone.

UP AND AWAY Point your phone at the sky and find stars hidden by daylight. Aim at a tourist spot and see its history plus info for visitors. For an augmented-reality check, tap into crime stats.

MORE >

: 9:25 p.m.
representing

HERCULES

U.S. Capitol complex
0.7 miles

... Construction of the
Capitol began in 1793.
When built, it was ...

CORONA
BOREALIS

Robbery
270 feet west
18 days ago

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UP AND AWAY Point your phone at the sky and find stars hidden by daylight. Aim at a tourist spot and see its history plus info for visitors. For an augmented-reality check, tap into crime stats.



622-624 North Carolina Ave. SE
900 feet



List price: \$2,995,000
Bed: 7 Bath: 8
On market: 420 days

flickr: Eastern Market Fire
510 feet



Taken: 2007-04-30
09:35:35 a.m.

Peregrine Espresso
195 feet
Free Wi-Fi

Bus stop
70 feet

Nearest for

32 34 36
A11 C40
CIRC

Subway stop
140 feet

Nearest for
Orange Line
Blue Line

Twitter users in the area

perfect day to head to @EasternMarketDC
anyone want to meet up? #spring #dc #market
Posted by @ARpro 10 minutes ago

STREET PALS The Tweeps Around app tells if Twitter users are near. Flickr displays area photos by members. To come: an app to match faces to social-network profiles.

REAL DEALS Various apps can steer you to mass transit options, good food, and Wi-Fi spots. You can also learn the price of that town house that's up for sale.

MORE



flickr: Eastern Market Fire
510 feet



Taken: 2007-04-30
09:35:35 a.m.

Bus stop
70 feet

Nearest for

- 32 34 36
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- CIRC



Subway stop
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- Blue Line



EasternMarketDC
spring #dc #market
tes ago

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PHOTOS: OLIVER UBERTI, NGM STAFF

2009
Smart
phone



2010
Eyewear



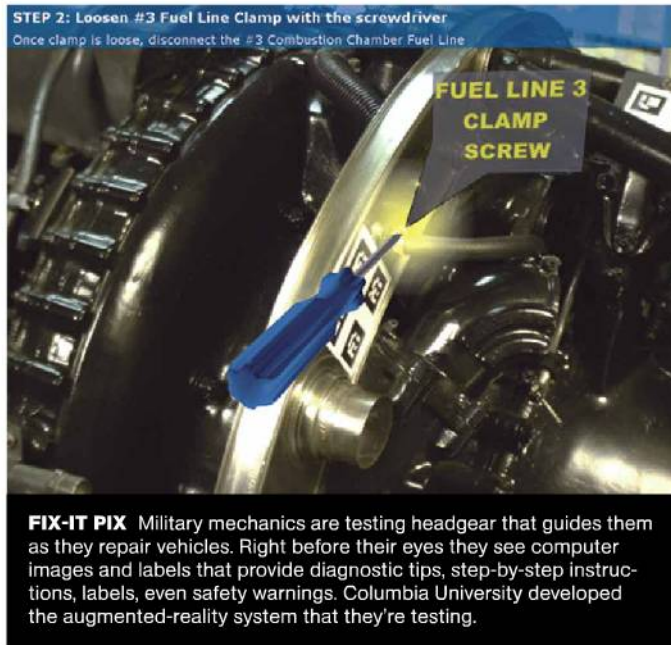
2015?
Contact
lenses



YOU COULD CALL IT REALITY 1.0—the unvarnished world presented to us by our five senses. It's not always the most user-friendly of places. We get lost in unfamiliar cities; we meet people whose language we don't understand. Fortunately there's an upgrade in the works that might eliminate some of the bugs: augmented reality, or AR. This emerging technology superimposes computer-generated images on the real world, courtesy of a cell phone camera or special video glasses.

Early forms of AR have already arrived. After downloading software, owners of smart phones like the iPhone and Droid can use the built-in GPS, compass, and camera to find information about nearby ATMs and restaurants, the closest subway stop, and other points of interest in some cities. With AR you might aim a phone's camera at a restaurant, and on the screen you'll see not just the venue but also a review hovering above it.

The U.S. Marine Corps is testing AR technology developed at Columbia University to train mechanics. They don headgear that projects animated 3-D computer graphics onto the equipment (*Touch Text button to read more.*)

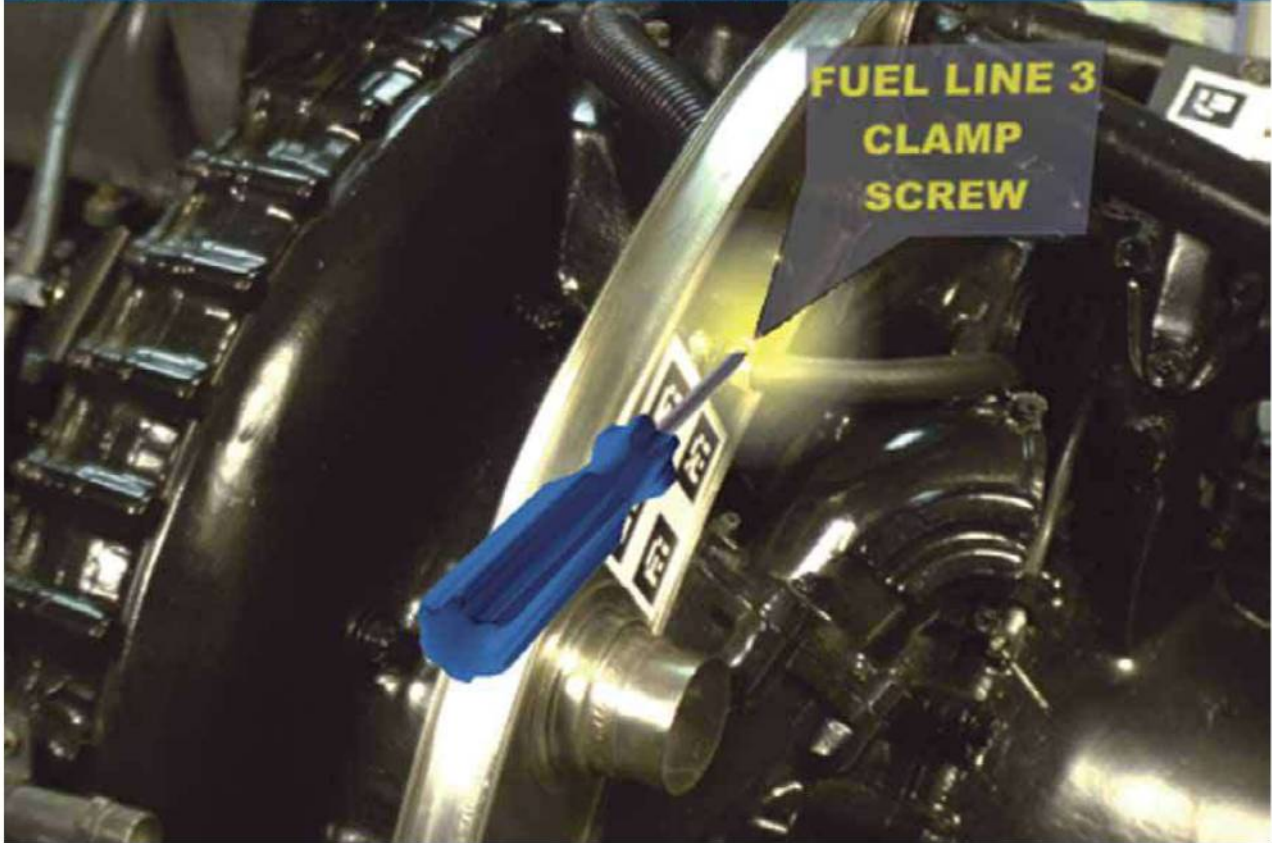


FIX-IT PIX Military mechanics are testing headgear that guides them as they repair vehicles. Right before their eyes they see computer images and labels that provide diagnostic tips, step-by-step instructions, labels, even safety warnings. Columbia University developed the augmented-reality system that they're testing.

Text

ART: OLIVER UBERTI, NGM STAFF PHOTO: STEVEN HENDERSON AND STEVEN FEINER, COMPUTER GRAPHICS AND USER INTERFACES LAB, COLUMBIA UNIVERSITY

STEP 2: Loosen #3 Fuel Line Clamp with the screwdriver
Once clamp is loose, disconnect the #3 Combustion Chamber Fuel Line



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KING TUT'S FAMILY SECRETS

*DNA evidence reveals the truth
about the boy king's parents and new clues
to his untimely death.*





Icon of ancient Egypt, the teenage pharaoh's funerary mask immortalizes his features in gold, glass, and semiprecious stones. This and other treasures from his tomb, now in Cairo's Egyptian Museum, attract a constant swirl of visitors.







Hidden in the desert canyons west of the Nile, the Valley of the Kings holds the tombs of King Tut and his royal relatives. In antiquity this was considered a secluded spot. Today the growing suburbs of Luxor shimmer nearby.

Egypt's head archaeologist, Zahi Hawass (at right) confers with DNA experts after the extraction of bone tissue from one of the mummies found in KV35, a tomb in the Valley of the Kings.

MUMMIES CAPTURE OUR IMAGINATIONS AND OUR HEARTS. FULL OF SECRETS AND MAGIC, THEY WERE ONCE PEOPLE WHO LIVED AND LOVED, JUST AS WE DO TODAY.

I believe we should honor these ancient dead and let them rest in peace.

There are some secrets of the pharaohs, however, that can be revealed only by studying their mummies. By carrying out CT scans of King Tutankhamun's mummy, we were able in 2005 to show that he did not die from a blow to the head, as many people believed. Our analysis revealed that a hole in the back of his skull had been made during the mummification process. The study also showed that Tutankhamun died when he was only *(Touch Text button to read more.)*

Kenneth Garrett has photographed 15 stories on Egypt for the magazine and collaborated with Zahi Hawass on six books.



A DECADE OF DISCOVERY

Since 2001 the Society has supported the research of Zahi Hawass, secretary general of Egypt's Supreme Council of Antiquities and a National Geographic explorer-in-residence. He is the author of *Zahi Hawass's Travel Guide to Secret Egypt*, forthcoming from National Geographic Books.

Egypt's head archaeologist, Zahi Hawass (at right) confers with DNA experts after the extraction of bone tissue from one of the mummies found in KV35, a tomb in the Valley of the Kings.



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GRAND- FATHER

Amenhotep III KV35

Now identified as Tut's grandfather, Amenhotep III (below and at right) ruled in splendor some 3,400 years ago. His mummy was buried with a wealth of goods. Several hundred years later, priests seeking to protect such royal remains from tomb robbers wrapped the mummies in fresh linens and reburied them in groups. Amenhotep III's body was found in 1898 hidden along with more than a dozen other royals in KV35, the tomb of his own grandfather, Amenhotep II.







GRAND- MOTHER

Tiye KV35EL

Among the remains in the KV35 cache was an unidentified mummy known until now only as the Elder Lady. DNA has identified this regal beauty as Amenhotep III's wife Tiye, the daughter of Yuya and Tuya, a nonroyal couple discovered in 1905 in their own undisturbed tomb, KV46. The grandmother of Tut, Tiye was embalmed with her left arm bent across her chest—interpreted as a queen's burial pose.

Her statue from the temple at Karnak (below) displays a similarly bent left arm.



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NGM MAPS

The innermost coffin of a miniature nested set from Tut's tomb was inscribed with the name of Tiye. Inside lay a lock of hair (far left, box at bottom), perhaps a memento of a beloved grandmother.

A mummified fetus of at least seven months' gestation (left) was found in Tut's tomb along with a tinier, more fragile fetus. One or both may have been the pharaoh's daughters.



DEEP IN THE VALLEY OF THE KINGS, guards' tents flank the rectangular opening to King Tut's newly discovered tomb. Workmen's huts, built here after the young pharaoh was buried and forgotten, had hidden the location for more than 3,000 years. After moving tons of stone and digging test pits, archaeologist Howard Carter finally uncovered the stairs leading to four treasure-filled chambers in November 1922. *NEW YORK TIMES/REDUX*

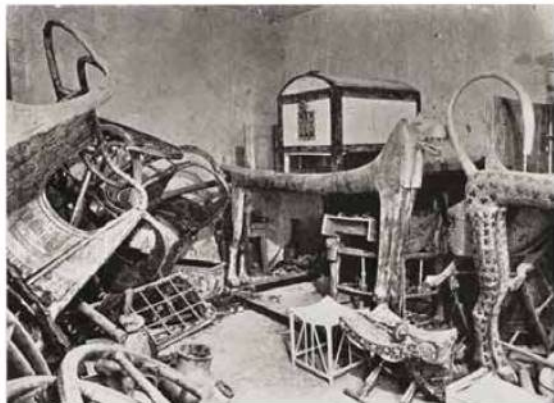


Touch to see a gallery of archival photos from the excavation of Tut's tomb.





Touch to see a gallery of archival photos from the excavation of Tut's tomb.



FATHER

Akhenaten KV55

The identity of King Tut's father has long been a mystery. One candidate is the heretic pharaoh, Akhenaten, who abandoned the gods of the state to worship a single deity. In 1907 a badly decayed mummy was discovered in KV55, a small tomb in the Valley of the Kings containing a jumble of artifacts connected to various kings and queens of the late 18th dynasty. Royal epithets on the defaced coffin suggested the body inside might be Akhenaten. DNA now confirms the mummy to be a son of Amenhotep III and Queen Tiye—known to be the parents of Akhenaten—and the father of King Tut.







MOTHER

KV35YL

According to DNA tests, this mummy, known as the Younger Lady, is both the full sister of the KV55 mummy—probably Akhenaten—and the mother of his child, Tutankhamun. (Incestuous relationships were not unusual among Egyptian royalty.) History records that Akhenaten married both the famous Nefertiti (below left) and a woman named Kiya (below right), but neither of these two women was ever said to be his sister. The Younger Lady is probably one of the five known daughters of Amenhotep III and Tiye.



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ROYAL RELATIONS

Genetic testing on 11 mummies identified Tut's parents, who were brother and sister. His father is the mummy from tomb KV55, likely Akhenaten, but the name of his mother is still a mystery. How were these relationships revealed? Scientists collected DNA, then looked at eight sets of markers to create a genetic fingerprint for each mummy.

- ==== Brother and sister
- Proposed relationship, insufficient data
- ♂ Male
- ♀ Female
- 👑 Pharaoh

JUAN VELASCO, AMANDA HOBBS, AND LAWSON PARKER, NGM STAFF
SOURCES: ZAHY HAWASS, SUPREME COUNCIL OF ANTIQUITIES, EGYPT;
CARSTEN PUSCH, EBERHARD KARLS UNIVERSITY OF TÜBINGEN, GERMANY

GREAT-GRANDPARENTS

♂ Yuya (KV46)



♀ Tuyu (KV46)



TOMB WHERE FOUND

GRANDPARENTS

♂ Amenhotep III (KV35)



♀ Tiye (KV35EL)



PARENTS

♂ Akhenaten (KV55)



♀ Name unknown (KV35YL)



NG T T

♂ T (KV62)



♀ Name unknown (KV21A)



♀ Name unknown (KV21B)

DREN

♂ Fetus 1 (KV62)



♀ Fetus 2 (KV62)





TUT

Tutankhamun KV62

Offspring of a union between siblings, this often studied pharaoh is now revealed to have had a congenital clubfoot afflicted with bone disease, which would have made walking painful. Inbreeding may have caused the deformity and even prevented him from producing an heir with his wife, who was probably his half sister. Whatever flaws King Tut inherited in this life, however, the image he left for eternity is one of luminous perfection—his iconic funeral mask crafted of gold, regarded by the ancient Egyptians as the flesh of the gods.



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WIFE

KV21A

When tomb KV21 was found in 1817, two well-preserved female mummies lay inside. Vandals later ripped them apart. Preliminary DNA results suggest that the one now missing her head (below) could be the mother of at least one of the fetuses from King Tut's tomb. If so, she is most likely Ankhesenamun, a daughter of Akhenaten and the only known wife of Tutankhamun. An ivory-paneled box (right), also from Tut's tomb, shows him with his beloved queen. New information about his health suggests that he probably needed to use the staff he holds as a crutch.





King Tut's Family Secrets

ROYAL INCEST

*The risks and rewards of close relations
among close relations*

BY DAVID DOBBS



WHEN NEW ENGLAND MISSIONARY Hiram Bingham arrived in Hawaii in 1820, he was dismayed to find the natives indulging in idolatry, hula dancing, and, among the ruling family, incest. The Hawaiians themselves did not share Bingham's shock at the royals' behavior. Royal incest, notes historian Joanne Carando, was "not only accepted but even encouraged" in Hawaii as an exclusive royal privilege.

In fact, while virtually every culture in recorded history has held sibling or parent-child couplings taboo, royalty have been exempted in many societies, including ancient Egypt, Inca Peru, and, at times, Central Africa, Mexico, and Thailand. And while royal families in Europe avoided sibling incest, many, including the Hohenzollerns of Prussia, the Bourbons of France, and the British royal family, often married cousins. The Spanish Habsburgs, who ruled for nearly 200 years, frequently married (*Touch Text button to read more.*)



When Western values pressed ashore, Hawaii's King Kamehameha III (left) donned a suit, but skirted a ban on royal incest. Thailand's King Rama V, posing with his half sister—and wife—and their children, faced no such prohibition.

BARON/GETTY IMAGES (TOP);
BISHOP MUSEUM

King Tut's Family Secrets

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SANDS OF TIME

*Aboriginal gods wanted
a paradise on Earth.
So they created Fraser Island.*



Pioneering plants get a toehold above the tide line on Australia's Fraser Island.



Following its keen nose, a dingo prowls the edge of a sand blow—an ever shifting expanse of silica.



Following its keen nose, a dingo prowls the edge of a sand blow—an ever shifting expanse of silica.



Tannin-rich runoff from Fraser's interior stains the sea in the aftermath of a summer storm.



BY ROFF SMITH

PHOTOGRAPHS BY PETER ESSICK

IT WASN'T ENOUGH SIMPLY TO CREATE THE WORLD; the Aboriginal god Beeral wanted it to be beautiful as well. And so he sent two trusted messengers, Yindingie and his spirit helper K'gari, to render the raw material of creation into a paradise. They did such a splendid job that by the time they were finished, K'gari longed to stay in this wonderful place forever. She lay down in the warm waters of a particularly beautiful bay, and there she went to sleep.

While she slept, Yindingie transformed her body into a long, slender island of crystalline sand, the largest such island in all the world. He clothed her with the most luxuriant of rain forests, painted her soft, sandy skin a rainbow of colors, and fashioned a chain of jewel-like lakes to be her eyes into heaven. He filled the air with colorful birds, and then, so she would never be lonely, he set a tribe (*Touch Text button to read more.*)

Roff Smith has covered every corner of Australia, his adopted country since 1981. Peter Essick specializes in nature and environmental photography.



Iron oxide colors Arch Cliff a luminous red, one of a palette of hues seen in Fraser's mineral-rich sands. Bound together by a kind of natural cement, some dunes rise 800 feet high. Trees and other vegetation manage to survive thanks to fungi that release nutrients from the sand.

Text



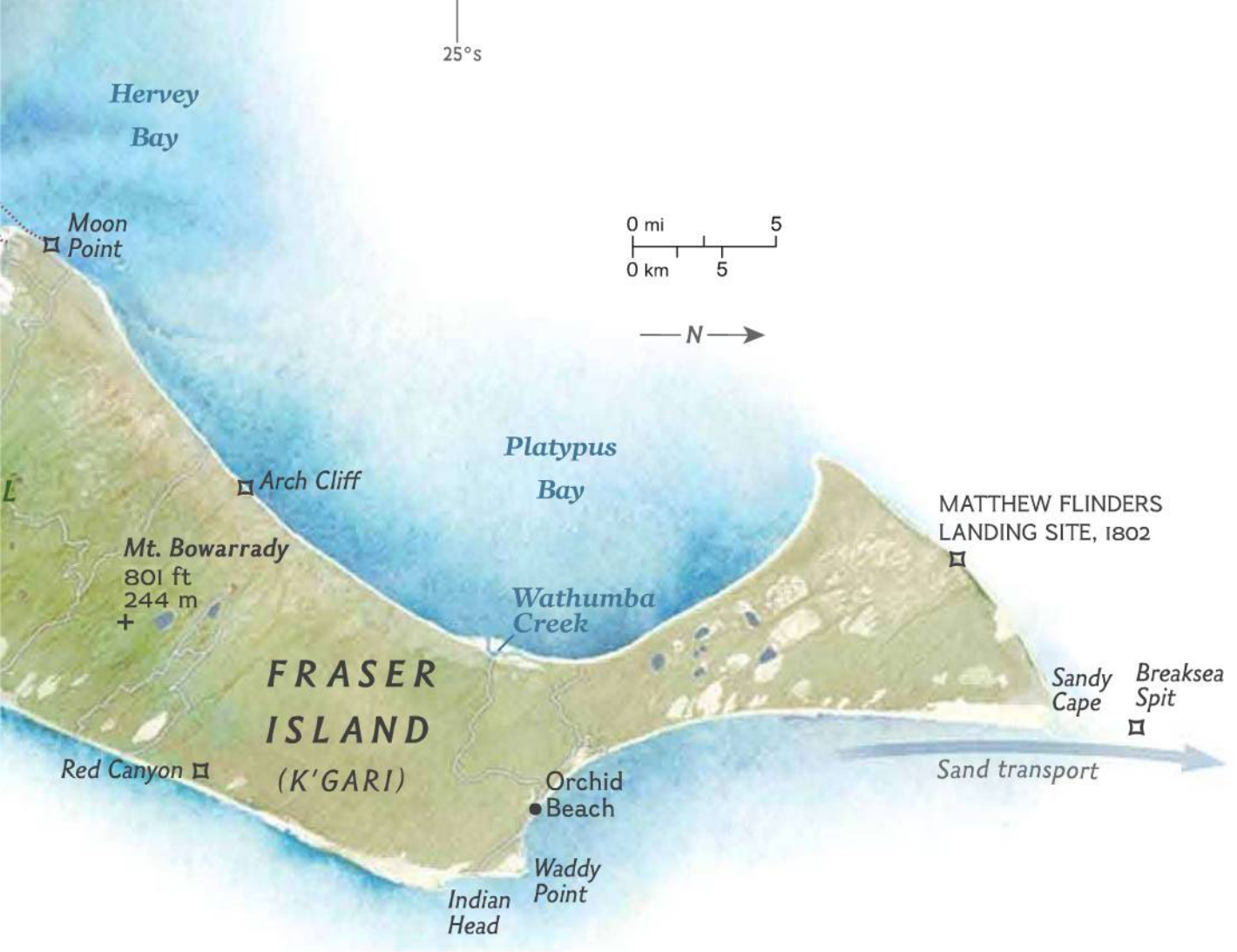
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AUSTRALIA'S SUBLIME SANDSCAPE

The world's largest sand island, Fraser was formed over some 750,000 years by current and wind, which transport tons of sand up Australia's east coast.

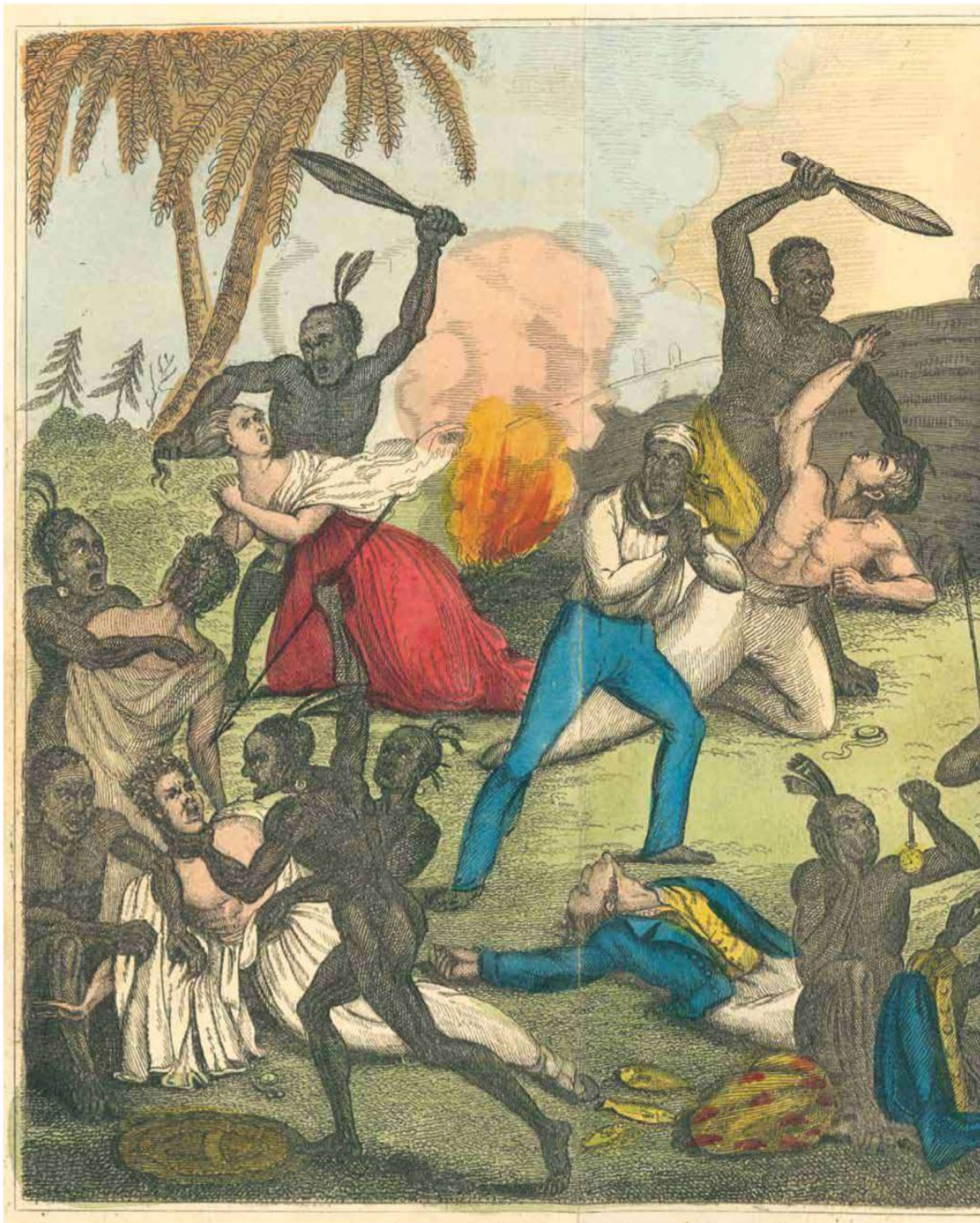
MARTIN GAMACHE AND SAM PEPPEL,
NGM STAFF. MAP ART. ROB WOOD.
SOURCES: GEOSCIENCE AUSTRALIA;
RON BOYD, UNIVERSITY OF NEWCASTLE

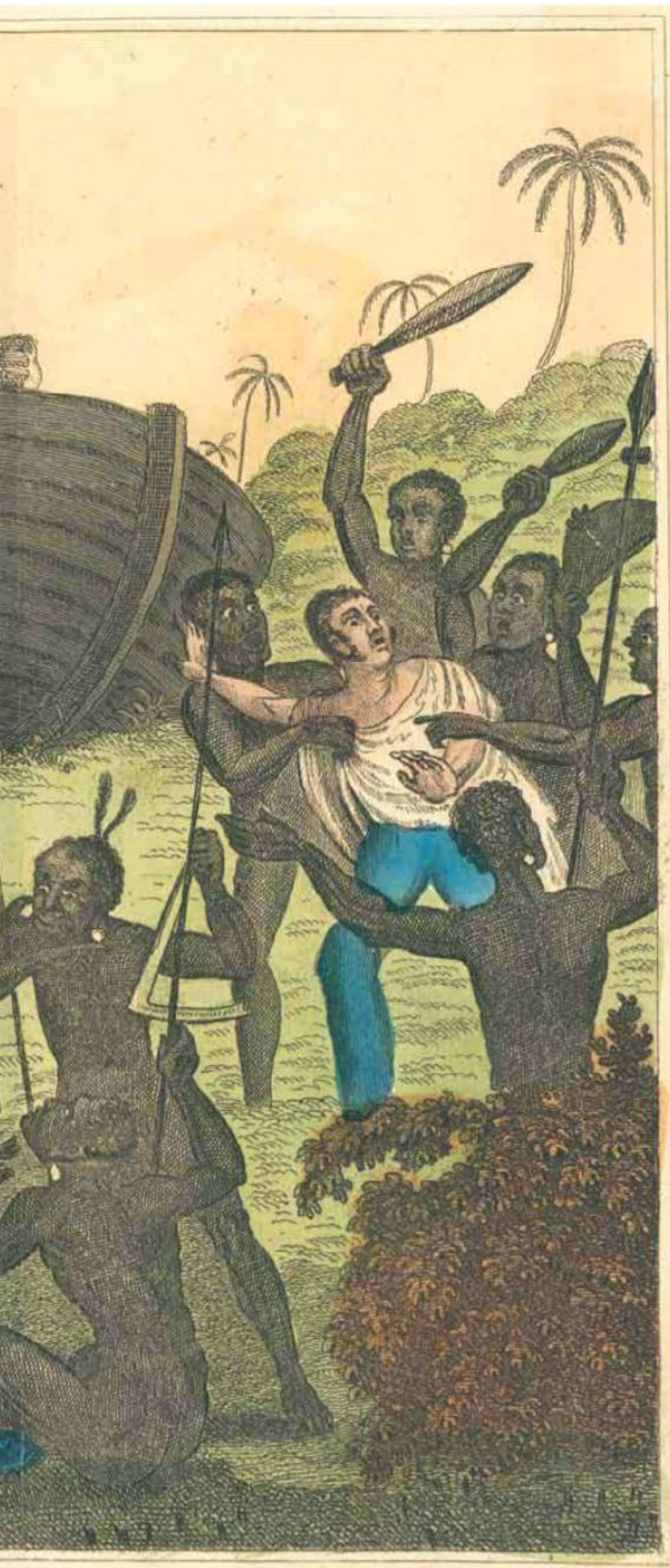


AUSTRALIA'S SUBLIME LANDSCAPE

The world's largest sand island, Fraser was formed over some 750,000 years by current and wind, which transport tons of sand up Australia's east coast.

MARTIN GAMACHE AND SAM PEPPLER,
NGM STAFF. MAP ART: ROB WOOD
SOURCES: GEOSCIENCE AUSTRALIA;
RON BOYD, UNIVERSITY OF NEWCASTLE





The island is named for Captain James Fraser, who, with his wife Eliza, was shipwrecked there in 1836. Eliza's sensational—and often contradictory—accounts of the ordeal include lurid tales of the murder and torture of passengers by local “savages,” depicted in this illustration from an 1838 book.

UNIVERSITY OF DELAWARE
LIBRARY, NEWARK

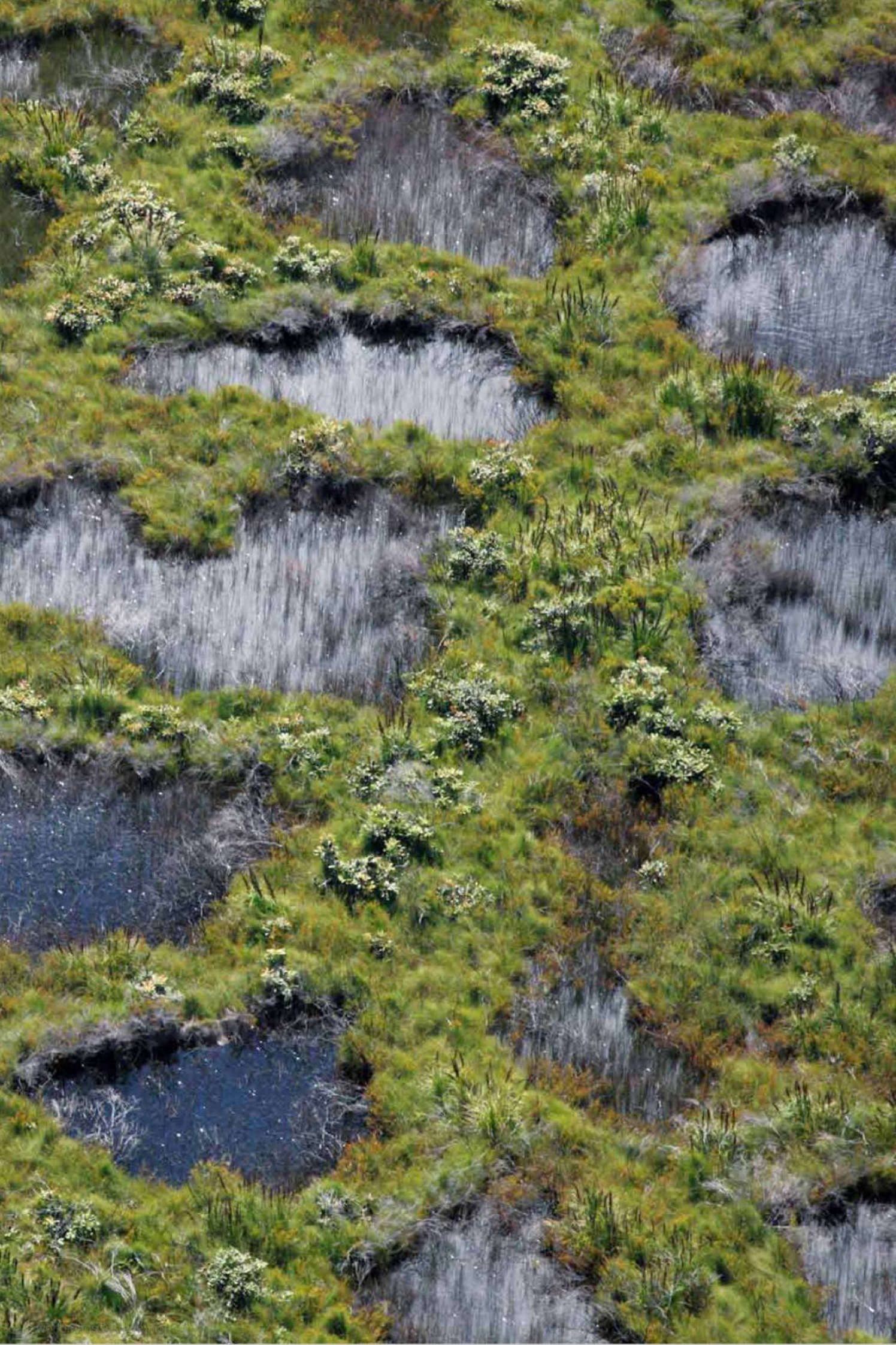


Bordered by beaches and interspersed with dunes and sand blows,
Fraser Island stretches more than 75 miles long and some 15 miles wide.





Ridges of peat and pools of dark, acidic water form a patterned peatland near Moon Point.





Wind and rain lash the face of Red Canyon, an ancient dune complex on the island's eastern flank.





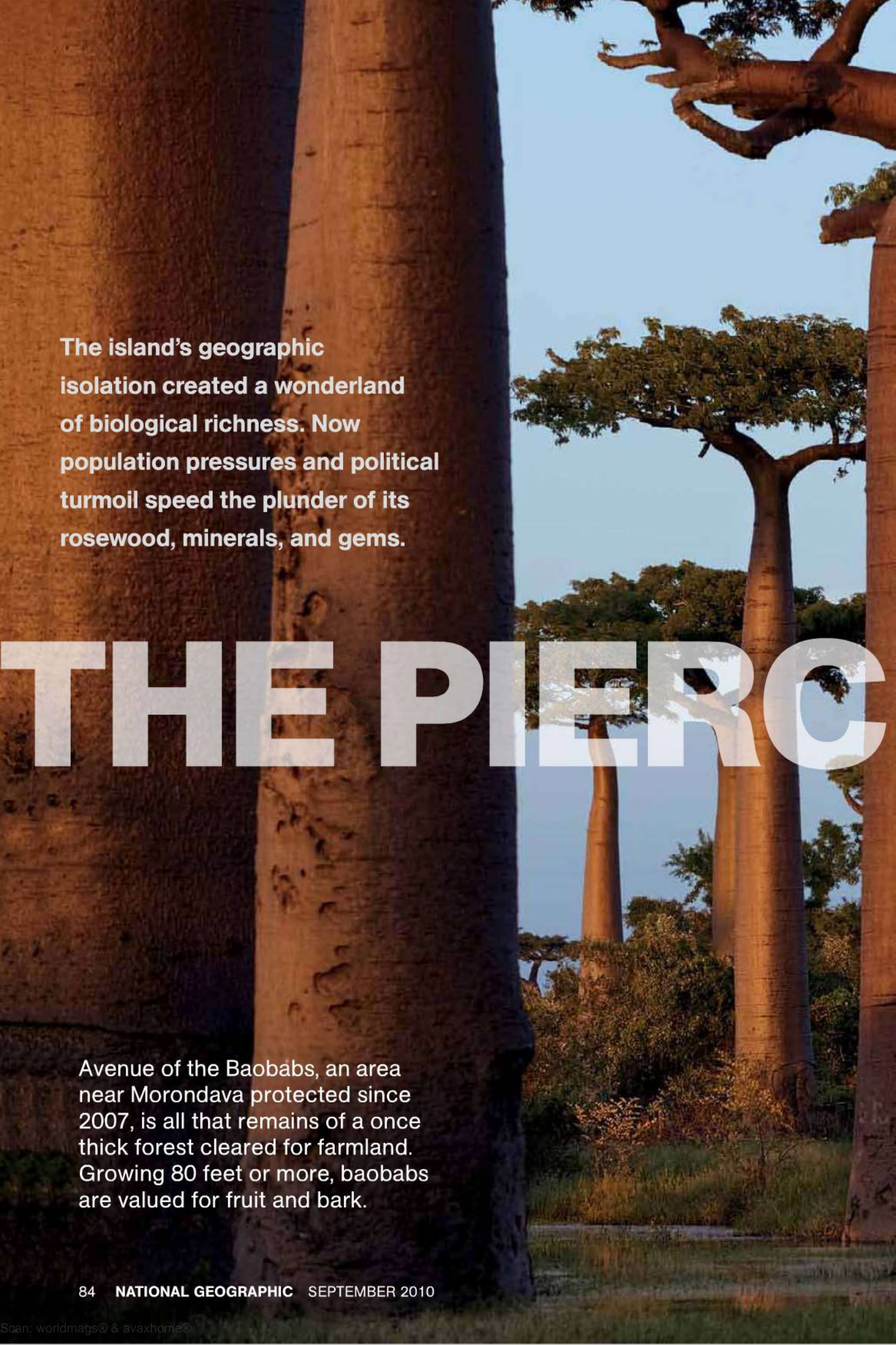
Coffee-colored Wathumba Creek spills into the jade shallows of Platypus Bay.





One of dozens of lakes on the island, Lake McKenzie shimmers in the starlight. During the day the lake's sugar white beach and windowpane water attract hundreds of visitors. Like the painters and poets who celebrated Fraser's otherworldly allure, they return home with stories and images of soul-stirring beauty.





The island's geographic isolation created a wonderland of biological richness. Now population pressures and political turmoil speed the plunder of its rosewood, minerals, and gems.

THE PIERC

Avenue of the Baobabs, an area near Morondava protected since 2007, is all that remains of a once thick forest cleared for farmland. Growing 80 feet or more, baobabs are valued for fruit and bark.

A photograph of several large baobab trees in Madagascar. The trees have thick, brown, textured trunks and green, leafy canopies. A person in a yellow shirt and shorts stands in the foreground on the left, providing a sense of scale. The background shows a clear blue sky with some light clouds and more trees in the distance.

ED HEART OF MADAGASCAR



A path cut for a pipeline serving the Ambatovy nickel mine slices into a species-rich forest. Ignoring the previous government's pledge to set aside 10 percent of the island for protected areas, the new leaders promote mining instead.



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BY ROBERT DRAPER

PHOTOGRAPHS BY PASCAL MAITRE



THE YOUNG MAN IN THE SHORTS AND SLEEVELESS T-SHIRT STANDS IN HIS PIROGUE AND PULLS IT UPSTREAM WITH A LONG BAMBOO POLE.

The Onive River is shallow and moves swiftly against him. Overhead a brooding sky opens up and dispenses barrages of rain, then sunlight, then more rain. The young man, whose name is Remon, is as heedless of the weather as the crocodiles lying prostrate on the shore.

Gliding past him in the opposite direction, one every three minutes, are other piroguemen. Remon calls out to them; they holler back. They are his river mates, each ferrying a dark, monstrous log of illegally harvested rosewood downstream from the rain forest to the lumberyards in the northeastern Madagascan city of Antalaha. There a paycheck awaits. Once Remon

drops us off at the edge of the forest, he will do the same.

Remon doesn't like the work. The timber boss who employs him—but whose name he does not know—has told Remon that he must paddle all day without pause because the rangers have been bribed to stay away for only a finite period, after which another bribe will be expected. Still, transporting the fallen trees is better than cutting them down, which had been Remon's previous job. He quit after concluding that the risks had become too great. While illegal logging had been going on for years, the pace had suddenly escalated: The forest was unpoliced and filled with organized gangs, a free-for-all of deforestation spurred by the collapse of Madagascar's government in March of 2009 and by the insatiable appetite of Chinese timber procurers, who imported more than 200 million dollars' worth of rosewood (*Touch Text button to read more.*)

Writer Robert Draper and photographer Pascal Maitre reported on the failed state of Somalia for the September 2009 issue. The article won the National Magazine Award for photojournalism.



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ROSEWOOD LOGGING



In Masoala National Park an illegal logger bares the valuable purple-black timber of a rosewood tree. One of hundreds of former farmers and city dwellers invading the park, he earns six dollars felling a tree worth several thousand to exporters.



Risking life and cargo, a deliveryman rides Onive River rapids. His 400-pound rosewood log is tied to a raft of lighter wood to keep it afloat.



Risking life and cargo, a deliveryman rides Onive River rapids. His 400-pound rosewood log is tied to a raft of lighter wood to keep it afloat.





Far from any law enforcement, a camp swells with workers and rosewood logs on the Ankavia River. Alarmed conservationists report that loggers ax as many as 200 trees a day in national parks, despite the ban on rosewood exports.



A team of men (left) is needed to move a centuries-old rosewood log. Handpicked by a buyer, the heavy log will be lashed to a raft and floated to town. On slow water (above) a crew ferries logs loaded onto a truck. Most go to China to make high-cost furniture and musical instruments.



A team of men (left) is needed to move a centuries-old rose-wood log. Handpicked by a buyer, the heavy log will be lashed to a raft and floated to town. On slow water (above) a crew ferries logs loaded onto a truck. Most go to China to make high-cost furniture and musical instruments.

SAPPHIRE MINING

Malagasy buyer Soaraza Arifeno, wearing a sun mask made from root paste, selects pink sapphires for her clients. The mine is near Ilakaka, a boomtown since gems were discovered in 1998.





Their efforts scored in the earth like tree rings, laborers dig for sapphires near Ilakaka. The area once supplied a third of the world's sapphires, but today exports have dropped sharply.



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Workers move ore-bearing dirt up a path cut by hand in an open-pit sapphire mine near Ilakaka.

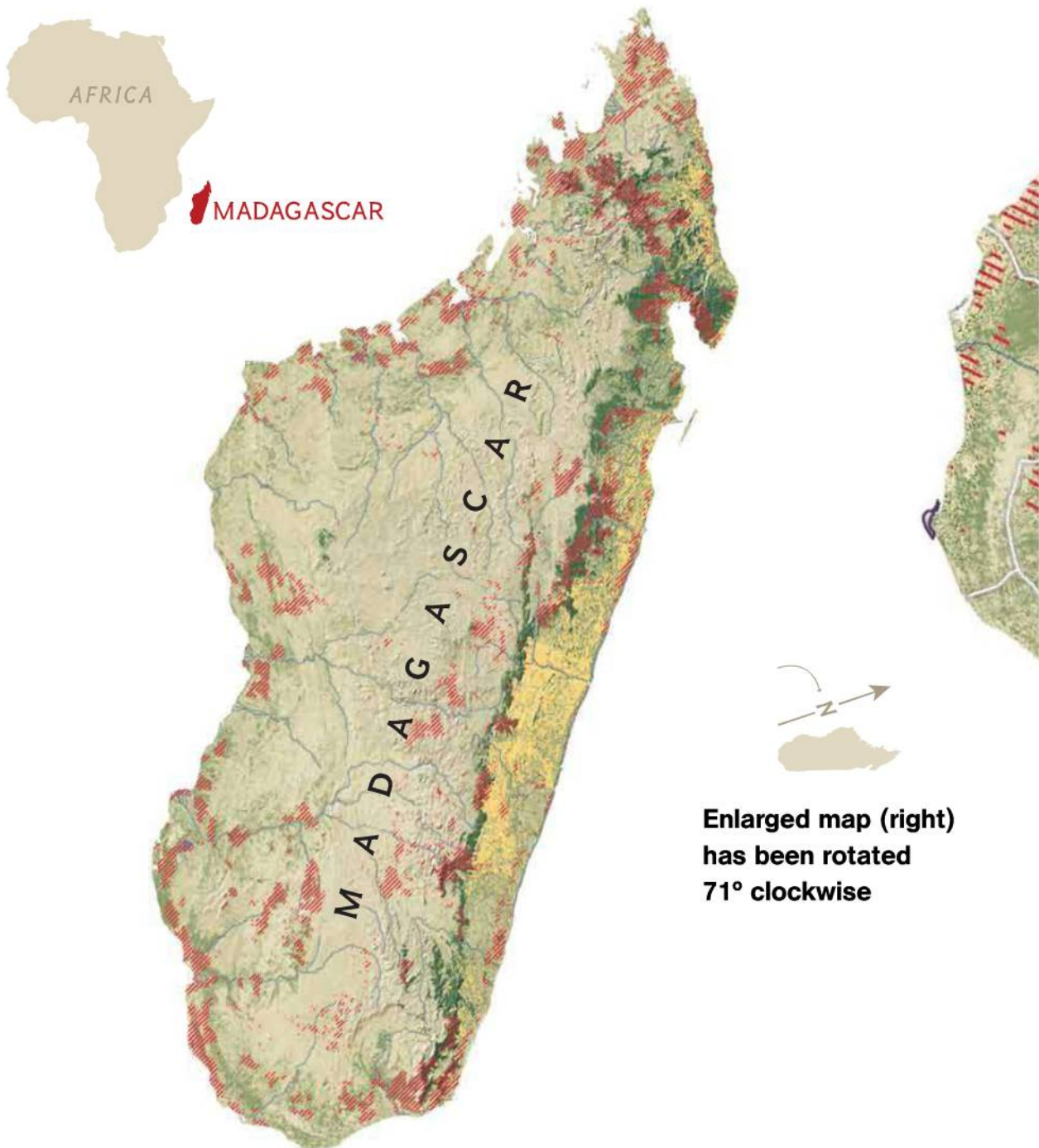


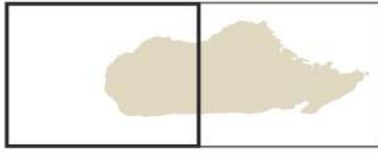
Lured by rumors of gems as big as a fist, many who flock to Ilakaka end up earning a few dollars a day on a shovel brigade.

Lured by rumors of gems as big as a fist, many who flock to Ilakaka end up earning a few dollars a day on a shovel brigade.

RARE MADAGASCAR

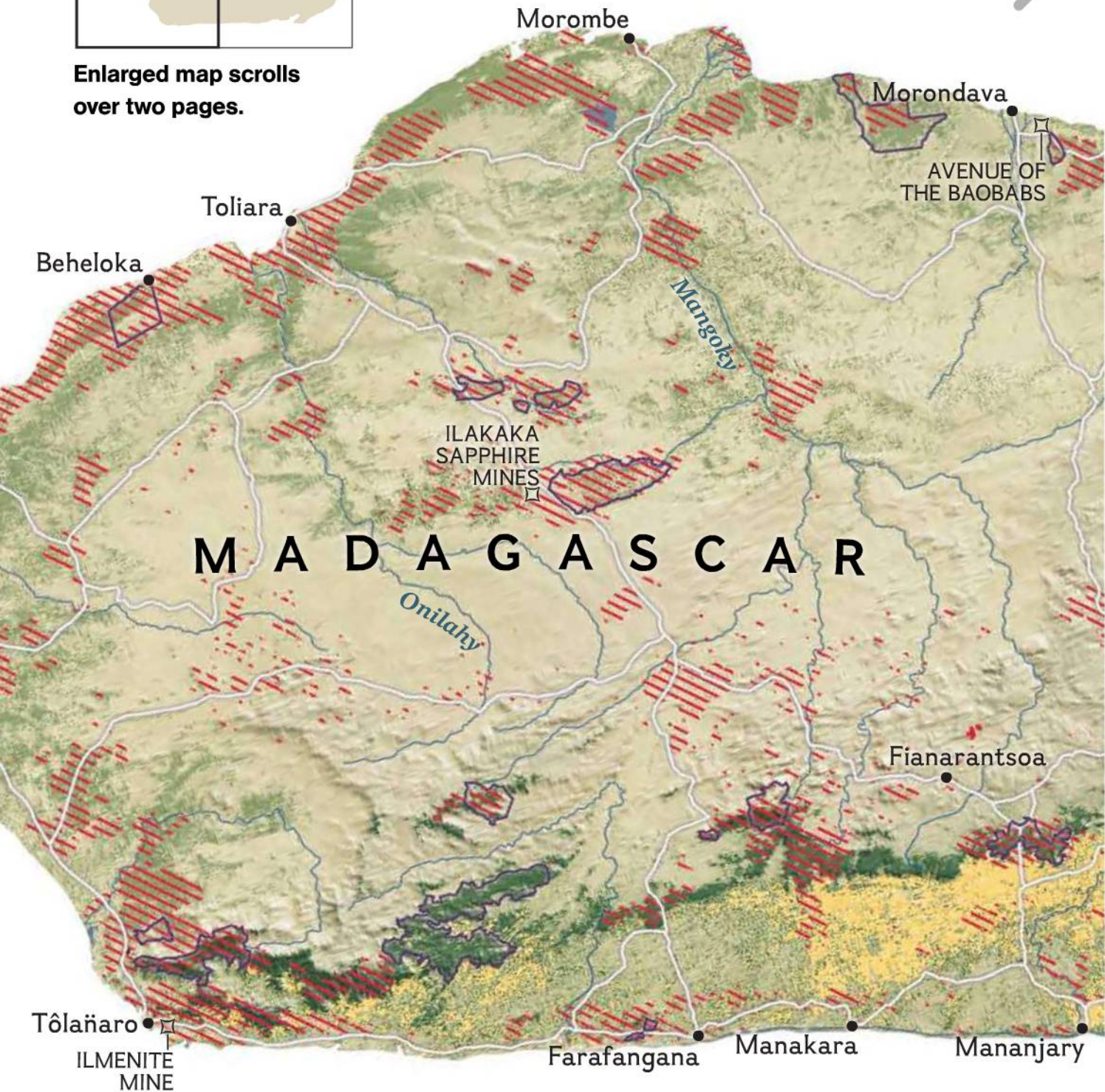
Remnants of the island's original vegetation serve as critical biodiversity hot spots, crammed with hundreds of vulnerable endemic plant and animal species. Yet today only half of the high-priority sites lie within the country's network of protected areas. With the overthrow of the government, ambitious conservation plans are on hold, and illegal logging and poaching run rampant in parks.





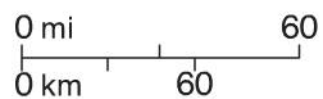
Enlarged map scrolls over two pages.

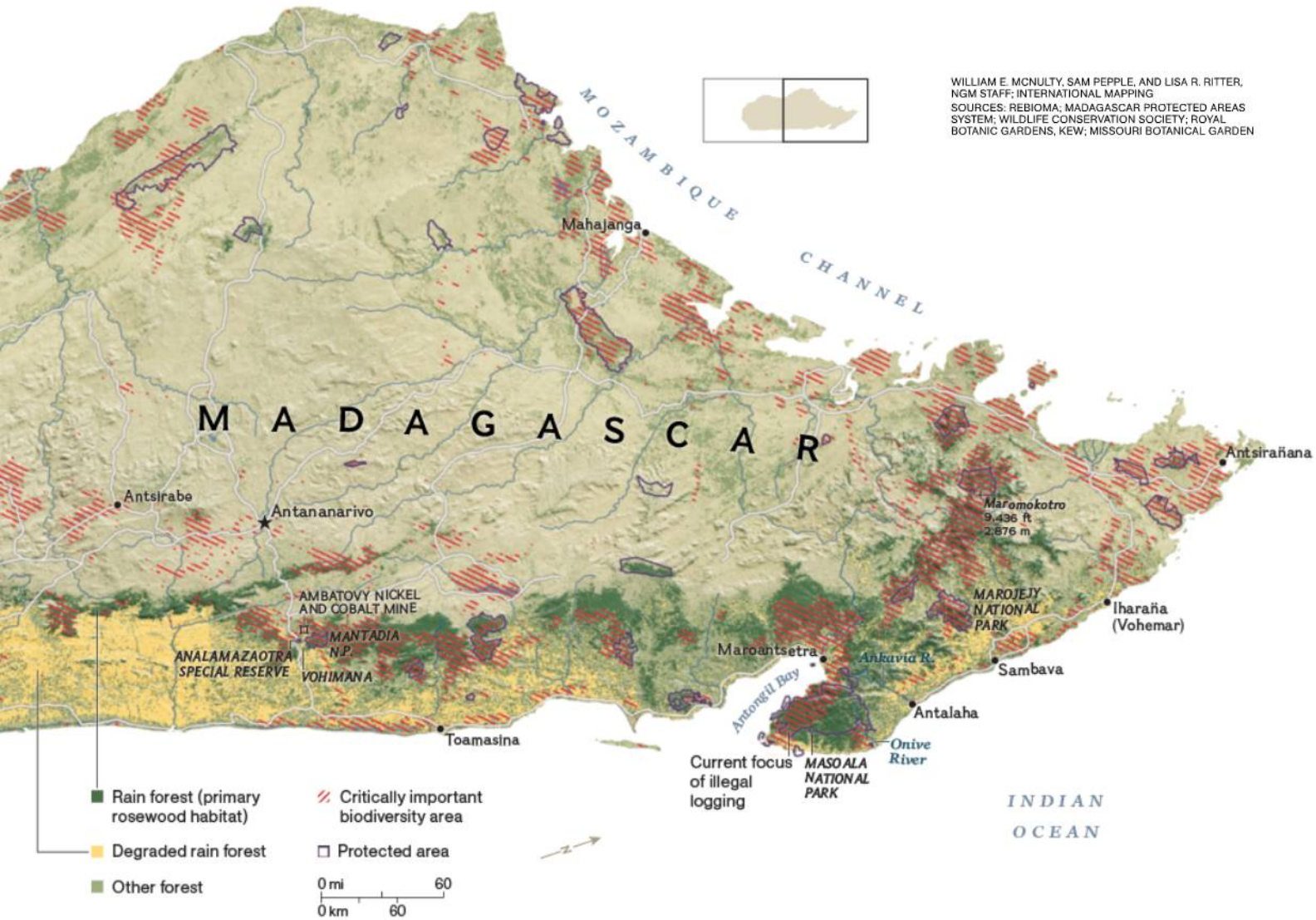
MORE >



- Rain forest (primary rosewood habitat)
- Degraded rain forest
- Other forest

- Critically important biodiversity area
- Protected area





WILLIAM E. MCNULTY, SAM PEPPE, AND LISA R. RITTER,
 NGM STAFF; INTERNATIONAL MAPPING
 SOURCES: REBIOMA; MADAGASCAR PROTECTED AREAS
 SYSTEM; WILDLIFE CONSERVATION SOCIETY; ROYAL
 BOTANIC GARDENS, KEW; MISSOURI BOTANICAL GARDEN



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BIQUE

CHANNEL

C A R

Antsirañana

Maromokotro
9,436 ft
2,876 m

MAROJEJY
NATIONAL
PARK

Iharaña
(Voahemar)

Maroantsetra

Ankavia R.

Sambava

Antongil Bay

Antalaha

Onive
River

Current focus
of illegal
logging

MASOALA
NATIONAL
PARK

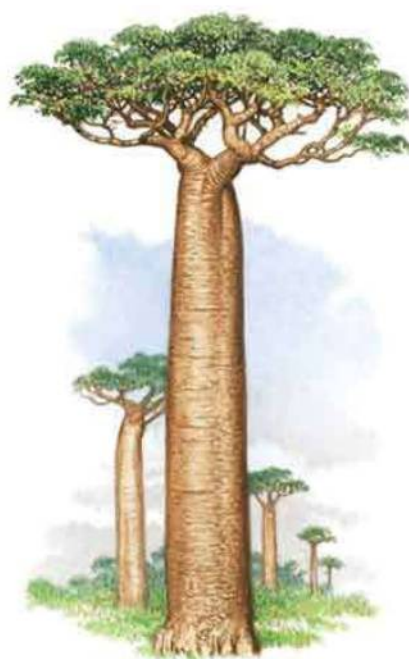
INDIAN
OCEAN

DWINDLING WONDERS

Some 90 percent of Madagascar's plant and animal species are found nowhere else, having evolved in isolation for millions of years after the island broke from Africa and India. Many are restricted to small, unprotected biodiversity areas.

Plants

Most of Madagascar's estimated 13,000 plant species are endemic, like the threatened Granddier's baobab, one of six baobab species unique to the island.



Mammals

Lemurs live only on Madagascar and the nearby Comoros islands. Fifty species make up nearly half of Madagascar's mammals. More than 20, including the silky sifaka, are endangered.



Reptiles

Chameleons, such as the colorful lesser chameleon, likely originated on Madagascar; two-thirds of the species are found here. Reptiles are under pressure from the pet trade.



Birds

As many as three-quarters of the 108 endemic species live only in wooded areas, including the long-tailed ground roller, restricted to the spiny forest of the southwest.



Amphibians

This population is all frogs, with 99 percent of the 373 species endemic, including the critically endangered harlequin mantella, found only on the central high plateau.





POOR LIFE IN A RICH LAND

A local market in the highland city of Antsirabe draws flower sellers as well as hungry children begging for handouts. Fewer families send their kids to school as the economy reels from falloffs in aid and tourism following a 2009 coup.



A local market in the highland city of Antsirabe draws flower sellers as well as hungry children begging for handouts. Fewer families send their kids to school as the economy reels from falloffs in aid and tourism following a 2009 coup.





For Sale: four-month-old ring-tailed lemur, \$50 or best offer. The owner poached the primate in a forest on the west coast. Hunters are increasingly catching lemurs, many of them endangered, to cash in on the illegal pet trade or to sell to restaurants like one in Sambava serving bush-meat stew.



Only fragrant vanilla pods pass the smell test at an Antalaha warehouse, where workers check for whiffs of mold. Prices for vanilla, a leading export earner, have plunged due to global overproduction, pushing farmers into forests to hunt and chop.



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A farmer and his oxen haul children to family rice plots near Morondava, along a path obscured during a flood. Madagascans are trying to figure out how best to survive in uncertain terrain.

RITUAL REMEMBRANCE

A meal of rice and zebu meat feeds guests gathered in a northern village for *famadihana*, a “turning of the bones” reburial ceremony still popular in rural areas. Families save for years to pay for the feast.









When tombs are opened during famadihana, family members celebrate with dance and music as they parade their ancestors, wrapped in new shrouds, around a village near Antsirabe.



Every five years or so, Jean Louis Rakotondrasoa (above) opens the family tomb. He inspects the bones of his relatives, wraps them in new cloth, and tenderly returns them to the darkness.



Every five years or so, Jean Louis Rakotondrasoa (above) opens the family tomb. He inspects the bones of his relatives, wraps them in new cloth, and tenderly returns them to the darkness.



Perched on the tendril of a *Passiflora* plant, the egg of the Julia heliconian butterfly may be safe from hungry ants. This species lays its eggs almost exclusively on this plant's twisted vines. *DRYAS IULIA*



Exquisite Castaways

ENGINEERED FOR SURVIVAL, INSECT EGGS
HANG ON AND HATCH WHEREVER THEIR
PARENTS DEPOSIT THEM.

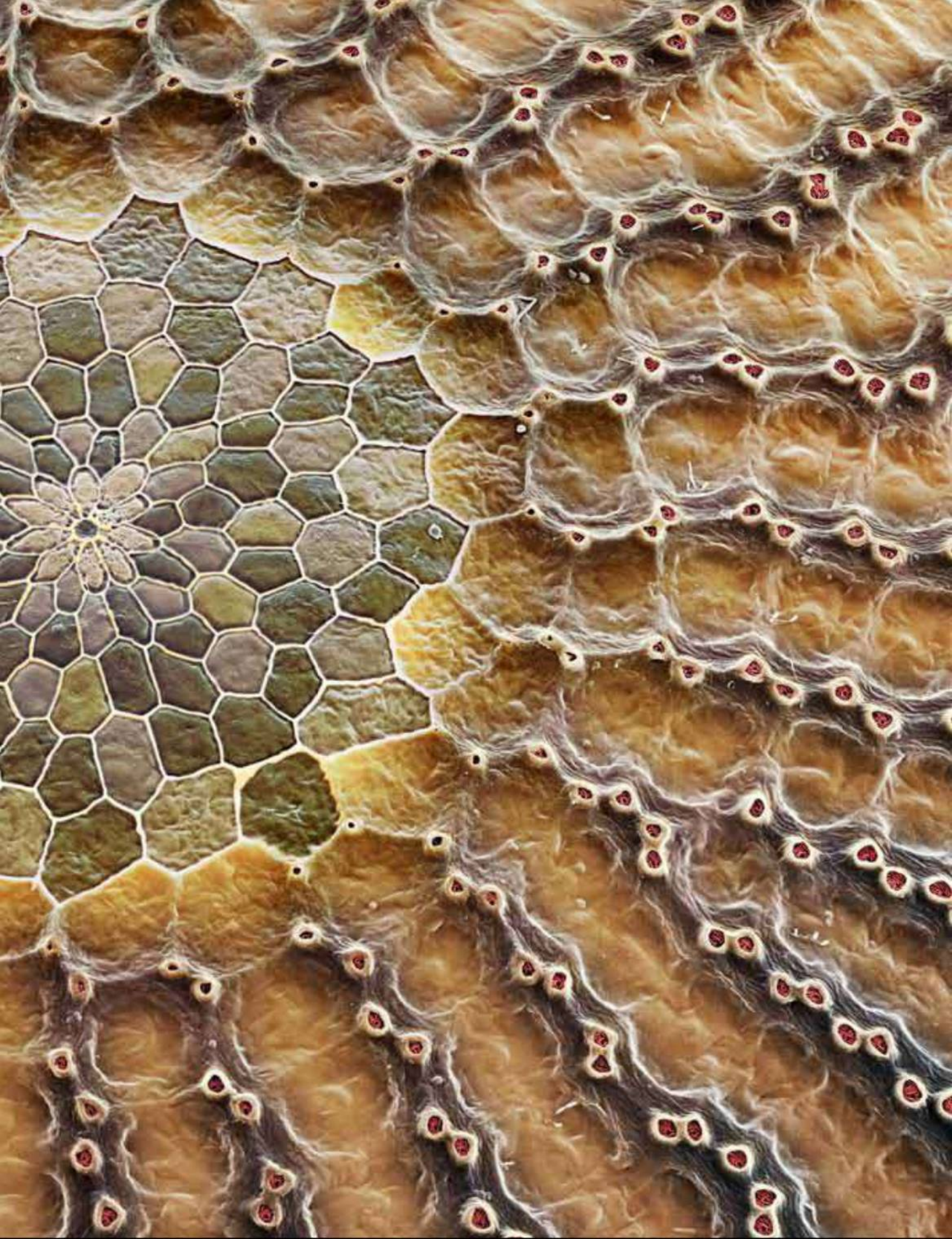


Stinkbugs often lay their eggs in clumps. Individual eggs are glued not only to each other but also to the leaf on which they are left. The delicate projections may aid, like snorkels, in respiration. *PENTATOMIDAE*



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The mosaic pattern on an owl butterfly egg looks like a landing pad. At the center is a minute opening, called a micropyle, through which the sperm enters the egg.
CALIGO MEMNON

BY ROB DUNN

PHOTOGRAPHS BY MARTIN OEGGERLI

**WE FOOL OURSELVES
MOST DAYS. WE IMAGINE
THE EARTH TO BE OURS, BUT IT
BELONGS TO THEM. WE HAVE BARELY
BEGUN TO COUNT THEIR KINDS.
NEW FORMS TURN UP IN MAN-
HATTAN, IN BACKYARDS,**

nearly anytime we flip a log. No two seem the same. They would be like extraterrestrials among us, except that from any distance we are the ones who are unusual, alien to their more common ways of life.

As the vertebrate monsters have waxed and waned, the insects have gone on mating and hatching and, as they do, populating every swamp, tree, and patch of soil. We talk about the age of dinosaurs or the age of mammals, but since the first animal climbed onto land, every age has been, by any reasonable measure, the age of insects too. The Earth is salted with their kind.

We know, in part, what makes the insects different. Those other first animals tended to their young, as do most of their *(Touch Text button to read more.)*

Rob Dunn and Martin Oeggerli worked together on a story about pollen in the December 2009 issue.



Text

The yellow eggs of the large white butterfly are laid in clumps on the undersides of cabbage leaves (above) and brussels sprouts. *PIERIS BRASSICAE*



The yellow eggs of the large white butterfly are laid in clumps on the undersides of cabbage leaves (above) and brussels sprouts. *PIERIS BRASSICAE*



THE EGGS IN THIS STORY range in diameter from 0.7 to 2 millimeters. The images were made with a scanning electron microscope, which uses beams of electrons to trace the surfaces of objects. The resulting black-and-white images were then colored to reflect the eggs' natural appearance.

Martin Oeggerli explains how he adds color to his images.



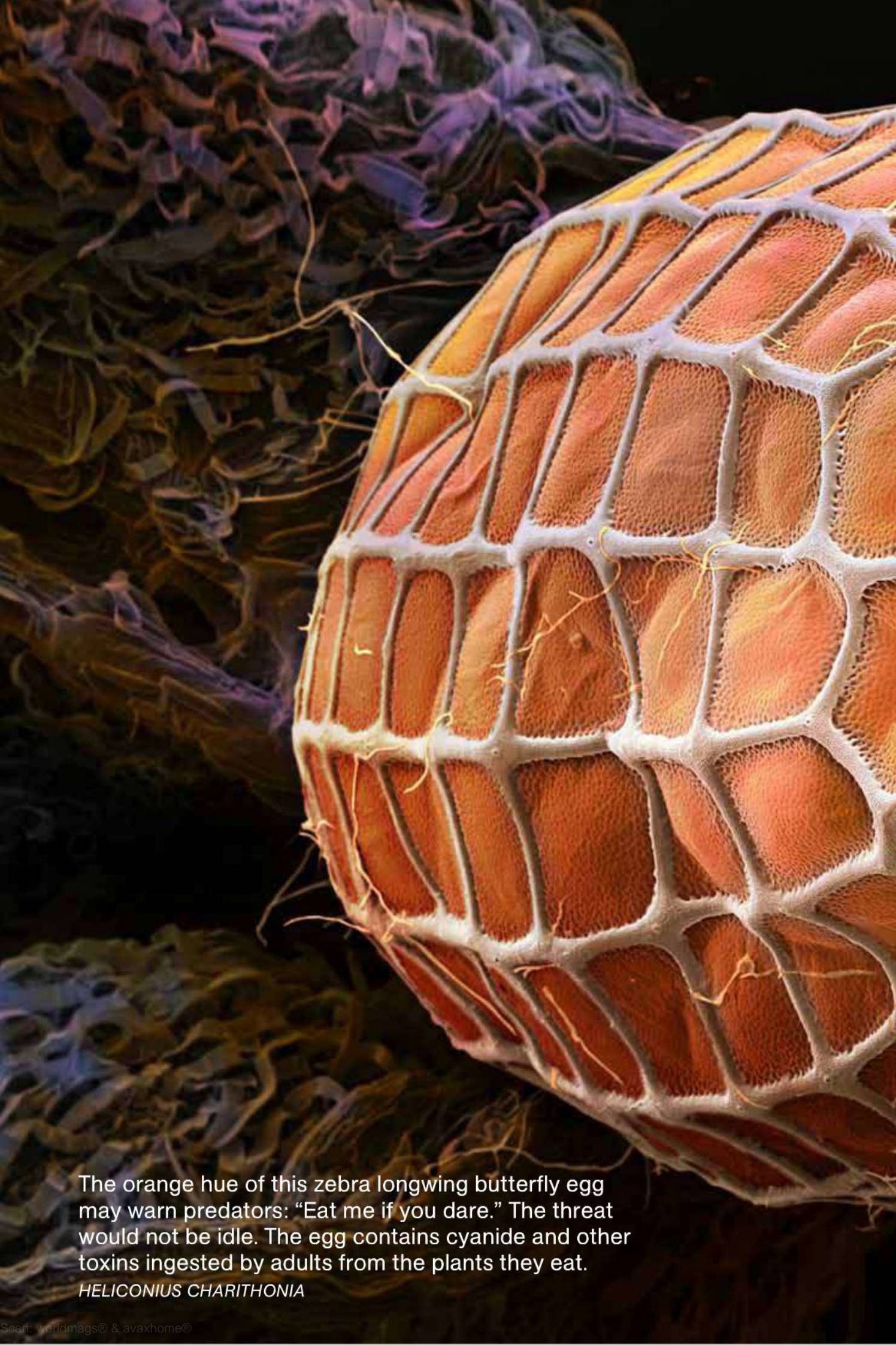
The Adonis blue butterfly is rare because it's choosy. It lays its eggs (like the one at left) only on horseshoe vetch, a European perennial. What's more, it looks for patches cropped by rabbits that allow easy landing. *LYSANDRA BELLARGUS*

The red band (above) signals a chemical reaction that follows fertilization. Inside the egg is the germ of a blue morpho, one of the world's largest butterflies, with a wingspan of five to eight inches. *MORPHO PELEIDES*



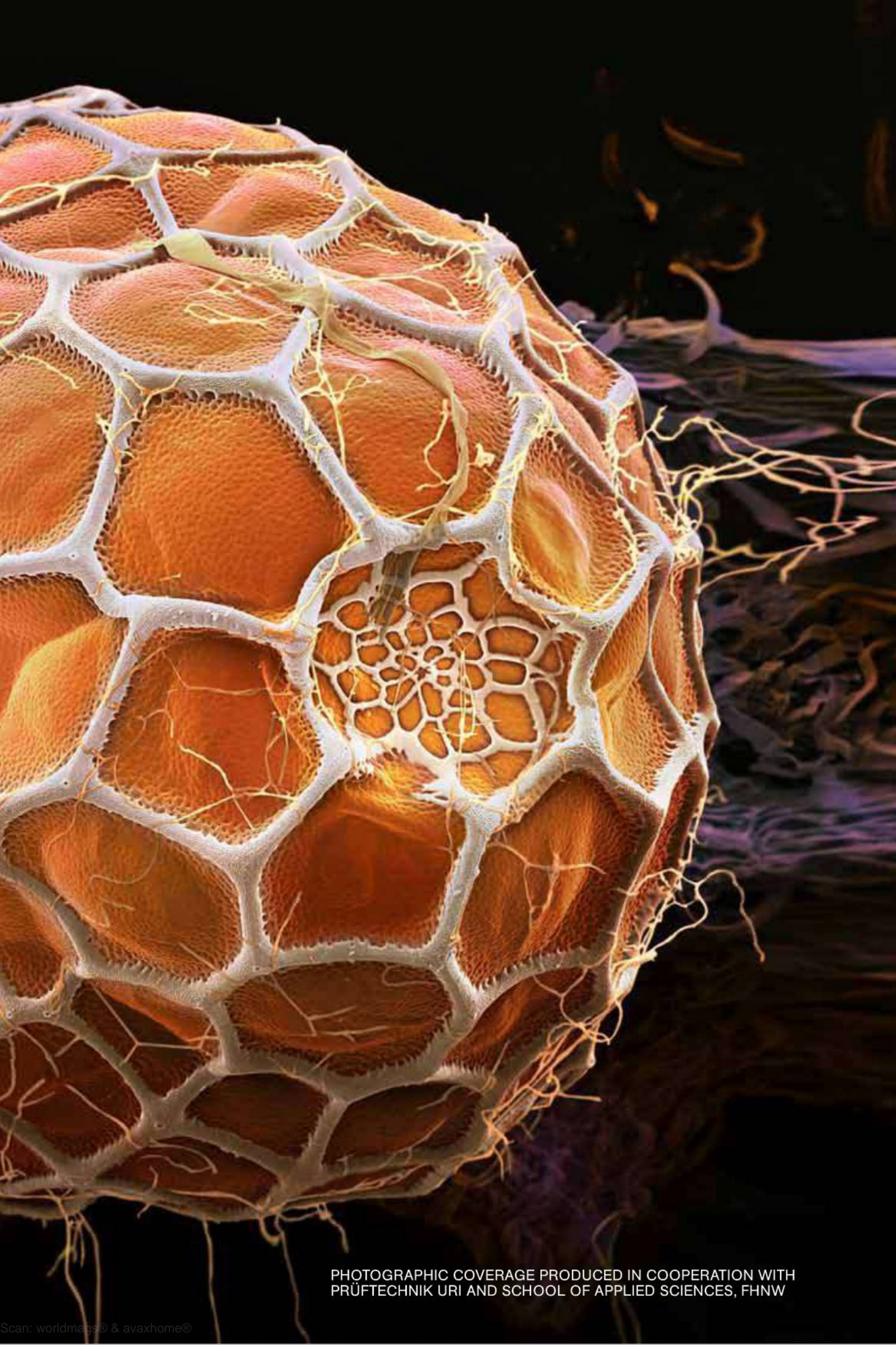
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The orange hue of this zebra longwing butterfly egg may warn predators: "Eat me if you dare." The threat would not be idle. The egg contains cyanide and other toxins ingested by adults from the plants they eat.

HELICONIUS CHARITHONIA



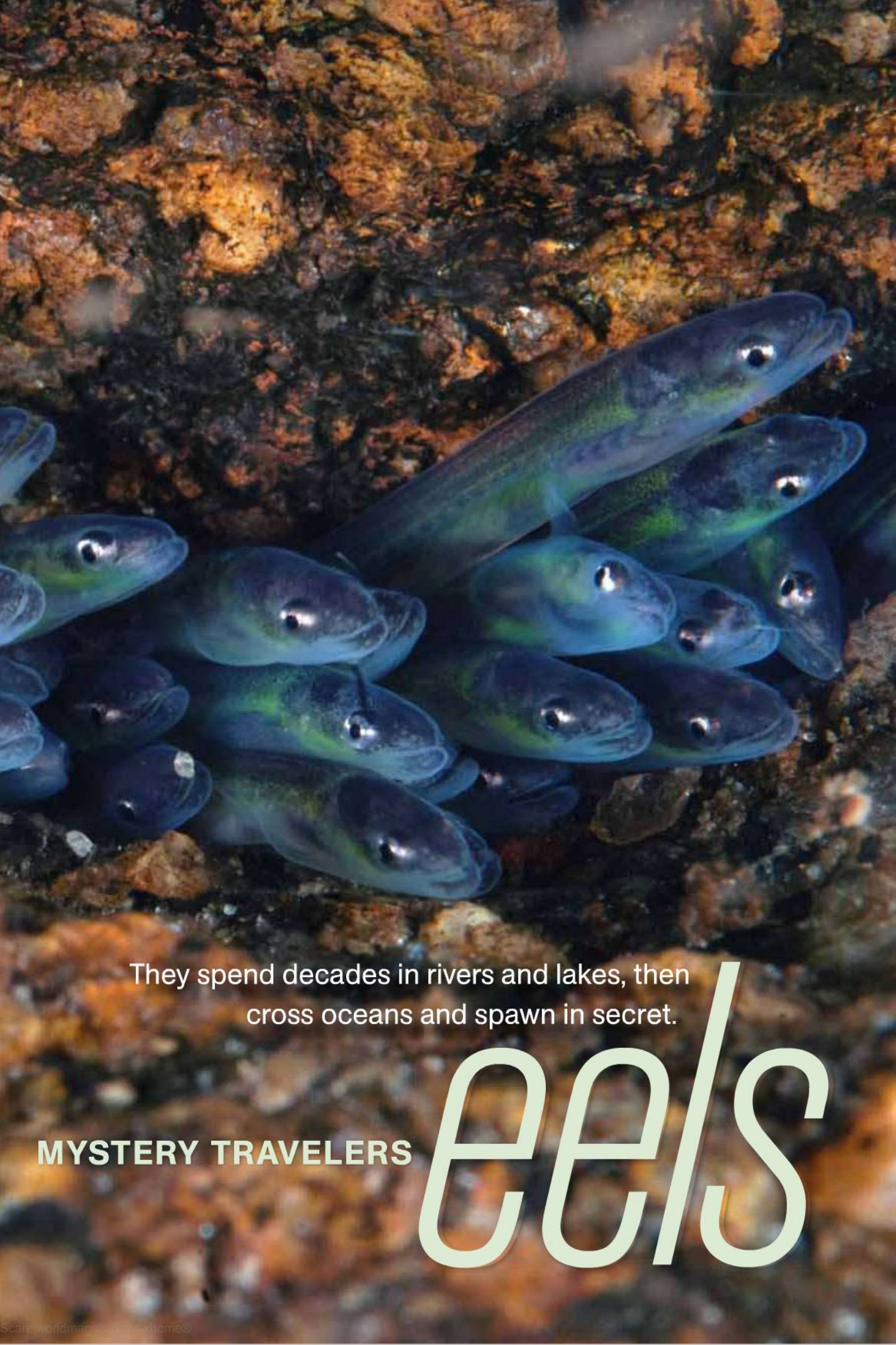
PHOTOGRAPHIC COVERAGE PRODUCED IN COOPERATION WITH
PRÜFTECHNIK URI AND SCHOOL OF APPLIED SCIENCES, FHNW



They spend decades in rivers and lakes, then
cross oceans and spawn in secret.

MYSTERY TRAVELERS

eels

A group of eels, likely European eels, are shown swimming in a rocky underwater environment. The eels have a silvery-blue color with a greenish-yellow stripe along their sides. They are clustered together, swimming towards the right. The background is a dark, textured rock surface with some orange-brown mineral deposits.

They spend decades in rivers and lakes, then
cross oceans and spawn in secret.

MYSTERY TRAVELERS

eels





At dusk, lights guide Yvonne Carey (far left) and daughter Genna as they dip eels from Nova Scotia's East River and store them in a blue-topped bag. Licensed to fish nine rivers, the Careys truck their catch home to holding tanks to await live shipment to Asia.

BY JAMES PROSEK

PHOTOGRAPHS BY DAVID DOUBILET

As a kid, I encountered eels more often in crossword puzzles or Scrabble (a good way to unload e's) than in the wilds near my Connecticut home. But in the flesh, when my friends and I caught them by mistake on fishing outings, they were alien and weird, unnameable things—snakes, maybe, or what?—and we were afraid to retrieve our hooks from their mouths.

One day an old man casting nearby told us they were fish. I knew that if this was true, eels were fish like no others. For much of my life I had little occasion to pay attention to eels. Then six years ago, while heading down Route 17 in the Catskills of New York State on a cold November day, I decided to follow a sign that said, "Delaware Delicacies, Smokehouse." Past the Cobleskill quarry, down a sinuous dirt road through a shadowy hemlock forest, I came to a small tar-paper shack with a silver smokestack, perched on a high bank overlooking the East Branch of the Delaware River. A man with a pointy white beard and a ponytail, who resembled a wood imp, hopped from behind the plywood door of the *(Touch Text button to read more.)*

James Prosek's book on eels for HarperCollins comes out in October. David Doubilet photographed clownfish for the January issue.



Early arrivals—Ray Turner calls them vanguard eels—wash into his trap at the start of the eel run, two nights in late September when large numbers migrate downstream. In that time Turner hopes to catch thousands of the slippery fish for his smokehouse business in the New York Catskills.

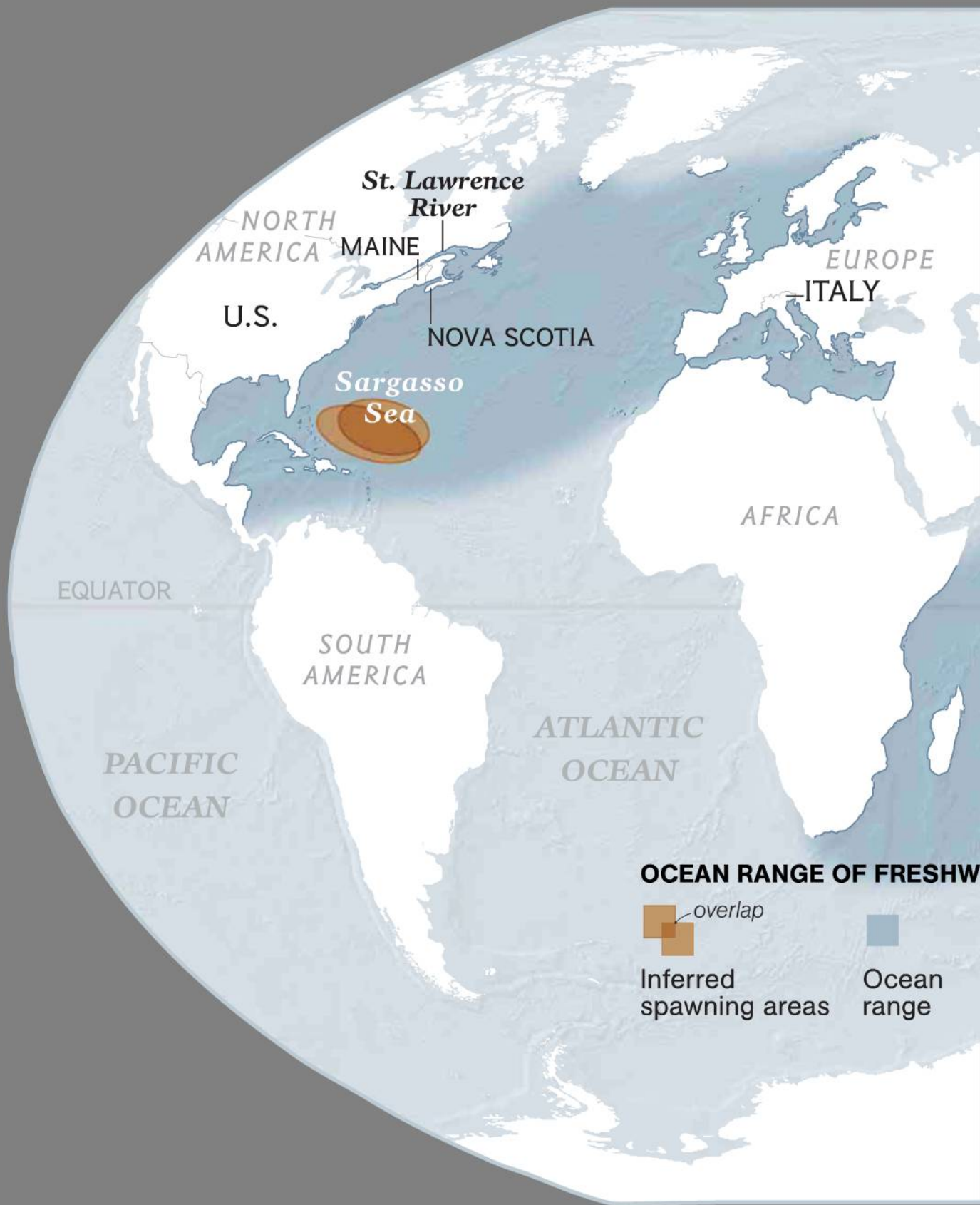
Ray Turner stirred the water, agitating some 500 eels, about as big around as a dollar coin and up to three feet long. They were lithe and sensuous—just magical.

Text



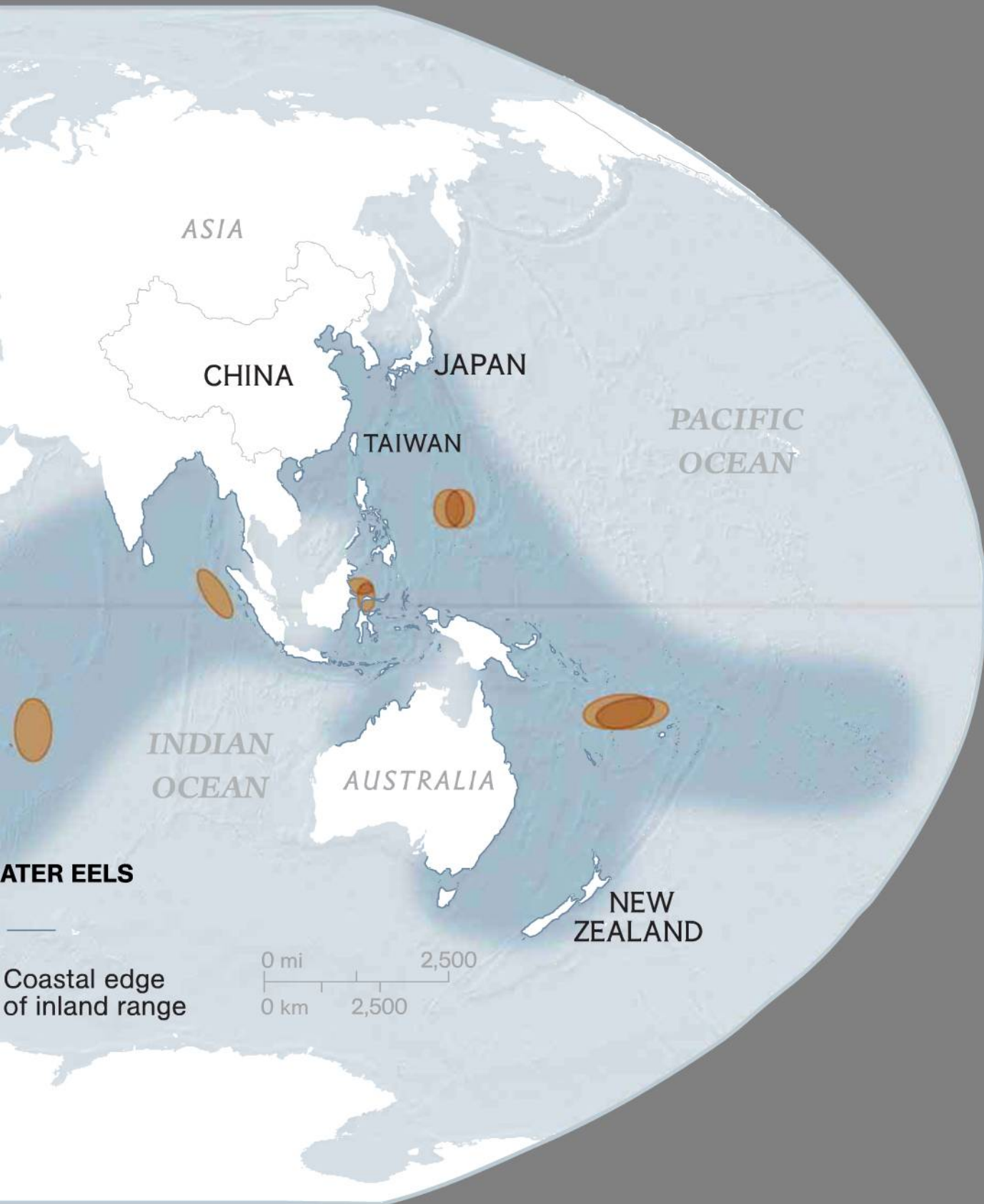
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and up to three feet long. They were lithe and
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From Sea to Stream

Scientists know where some of the 16 freshwater eel species and three subspecies spawn, but no one has ever reported seeing eel reproduction in the wild. Larval eels ride ocean currents to lagoons, estuaries, rivers, and lakes. Many eels—almost exclusively females—move far inland. Years or even decades later adult eels return home by unknown routes to spawn and die.



LISA R. RITTER, NGM STAFF; MAGGIE SMITH
 SOURCE: MICHAEL J. MILLER, ATMOSPHERE AND OCEAN
 RESEARCH INSTITUTE, UNIVERSITY OF TOKYO



New Zealand's longfin eels are giants, some topping six feet and 80 pounds, that can live for decades. Traditional Maori prize them as guardians of sacred spaces—and as dinner. These females at South Island's Willowbank Wildlife Reserve could be 30 years old.



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Yoshiaki Miyamoto hooked just one eel on his morning stint on Lake Biwa, near Kyoto. The Japanese believe eels boost energy and cool the blood in summer; local stocks are in decline.



Black eyes and red hearts dot glass eels scooped into a tank from Maine's Damariscotta River. This batch, worth some \$400 a pound, is bound for China. Eeling in the U.S. is heavily regulated; Maine is one of the few states allowing the export of glass eels.





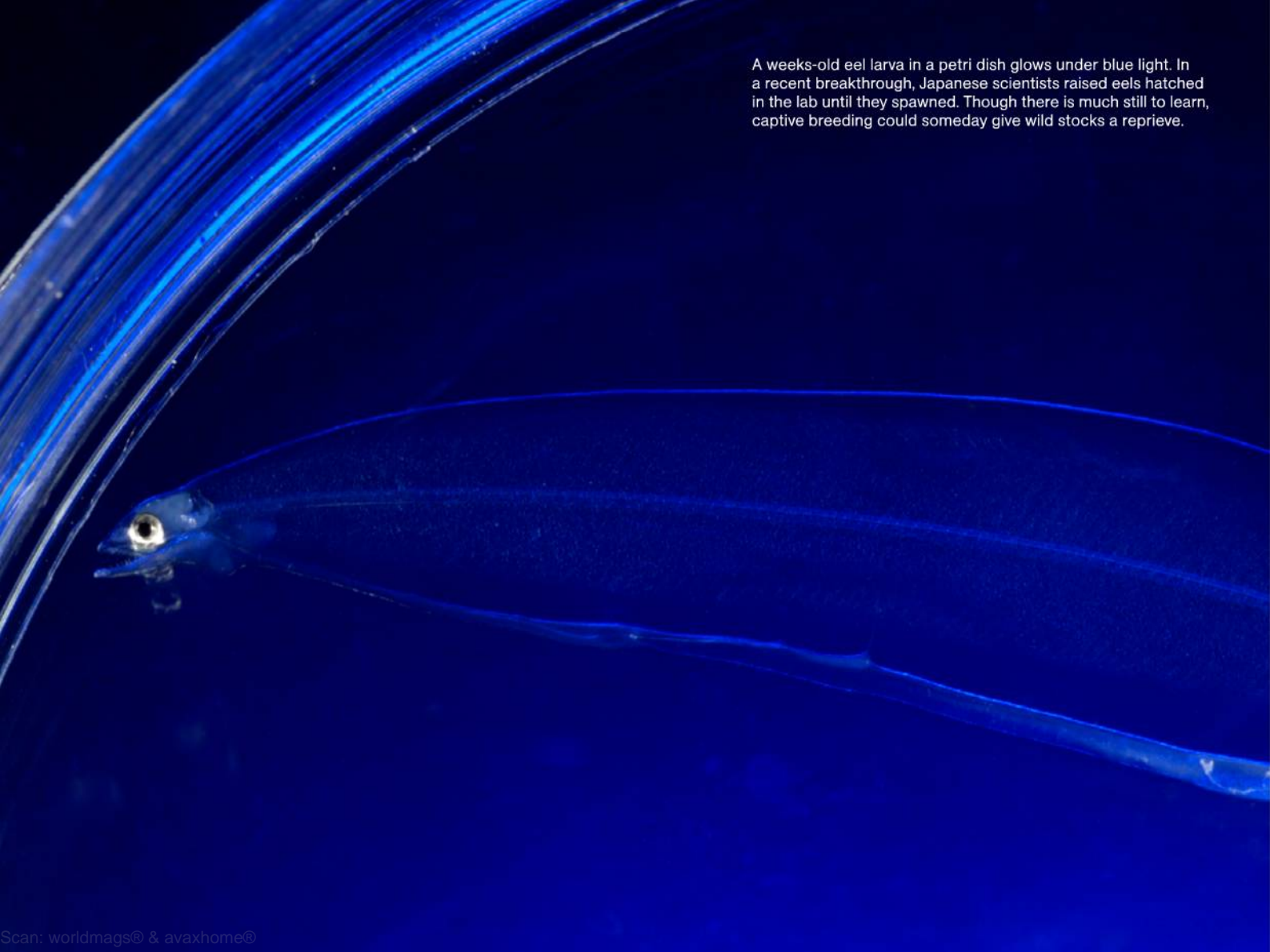
Eels cook over a beech and oak fire at Dutchman Alex Koelewijn's smokehouse. They melt in your mouth like fine chocolate, he says. "It's the oily and smoky taste that gives the most joy."

In one Maori myth, eels come from the sky,

having fallen when the heavens became too hot.

On Earth, some say, the movements of eels

make the rivers flow.

A close-up photograph of a translucent eel larva in a petri dish. The larva is elongated and tapers towards the tail. Its head is on the left, with a prominent, glowing yellow eye. The entire scene is illuminated with a strong blue light, which causes the larva to glow and creates a bright blue arc in the upper left corner of the frame. The background is dark, making the glowing larva stand out.

A weeks-old eel larva in a petri dish glows under blue light. In a recent breakthrough, Japanese scientists raised eels hatched in the lab until they spawned. Though there is much still to learn, captive breeding could someday give wild stocks a reprieve.

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Villagers carry Moimango, mummified half a century ago, up to his cliff-niche perch. His son, current “big man” Gemtasu (crouching), hopes to be mummified someday too.



PAPUA NEW GUINEA

Mastering Mummy Science

Mummy expert Ronald Beckett is helping a South Pacific culture revive a disappearing ancient tradition.

I love meeting new mummies. As a biomedical specialist, I've worked on hundreds of them over the past 15 years, everywhere from Thailand to Peru. Normally I study them in labs and museums, but in Koke, a village in Papua New Guinea, where I started working in 2008, mummies are a daily part of the living culture. There's a physical, emotional, human connection with them that's unique.

The first time I visited Koke, I was greeted by a man in tapa cloth with a cassowary bone through his nose. He was holding a bow and arrow. I smiled and thought, Wow, neat! In fact, he

PHOTO: ULLA LOHMANN

was issuing me a warrior's challenge: Why have you come? "I'm here to work on the mummy called Moimango," I said. "I'm here to examine and restore him so he can sit on the cliff for many years to come." The next thing I knew, the man was rubbing his nose against mine. He'd accepted my answer. Locking noses makes an official statement of welcome.

It was easier when I met Gemtasu, head of the Anga people of Koke. Thanks to photographer Ulla Lohmann's introduction, I had come at his request. Moimango was his father. He'd been a great warrior and shaman, and some 50 years ago he'd returned to the village from a hunt or a battle complaining of having the "short wind." He lay down by a fire and died. In keeping with tradition, Gemtasu and other family members mummified his body in a special smoking hut, and Moimango was placed in a cliffside gallery alongside other ancestors to watch over the village. But after many years out in the elements, Moimango needed some care.

Mummification was practiced for centuries in Koke, but it's a skill that's largely been forgotten. Christian missionaries have told the Anga there should be no mummifying because it's against God's law. Gemtasu requested my help in bringing *(Touch Text button to read more.)*



Ronald Beckett (at right) inspects the carcass of a forest pig villagers used to practice mummification techniques. The smoke, he found, is extremely acidic, inhibiting enzymes that contribute to decomposition.



About Our Grantee

Ronald Beckett, 57, is a professor emeritus of biomedical sciences at Quinnipiac University in Connecticut. He did fieldwork in April 2010 to study mummification techniques and rituals of Papua New Guinea's Anga culture.



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ON ASSIGNMENT

Eel Appeal Inside the National Kiwi Centre in Hokitika, New Zealand, is a two-story tank full of old eels. How old? “About 85 to 100 years,” says David Doubilet, who documented the fish with his photographic assistant and wife, Jennifer Hayes (above), for this issue. Doubilet and Hayes were allowed in the tank to demonstrate the length—about six feet—of these freshwater New Zealand longfins. The two were told to cover up fully or risk being chomped on. Although the eels did try to wriggle under their neoprene hoods and face masks looking for flesh, recalls Doubilet, “they were polite enough not to bite their guests.”



In a tank at a New Zealand aquarium an eel greets Jennifer Hayes.



PHOTO: DAVID DOUBILET

Society Updates

SPECIAL ISSUE

Oceans cover nearly three-fourths of our globe and play a role of equal significance in Earth's biodiversity. Our newest special issue explains the workings of our seas and explores ways to improve our relationship with them. Find *Ocean* on newsstands September 14 or at ngm.com/ocean-special (\$10.99).

NAT GEO CHANNEL

Go on patrol with the law officers of America's largest state in *Alaska State Troopers*, a weekly series beginning September 21 at 10 p.m. on the National Geographic Channel.

NG BOOKS

Soul of a Lion chronicles the true story of conservationist Marieta van der Merwe and the imperiled wild animals she devotes her life to in Namibia. Look for it in bookstores September 21 (\$26).



Exclusive photos of the Gulf disaster



Free poster
Our water
world

NATIONAL
GEOGRAPHIC

Inside
A time line of
great explorers
The legacy of
Jacques Cousteau

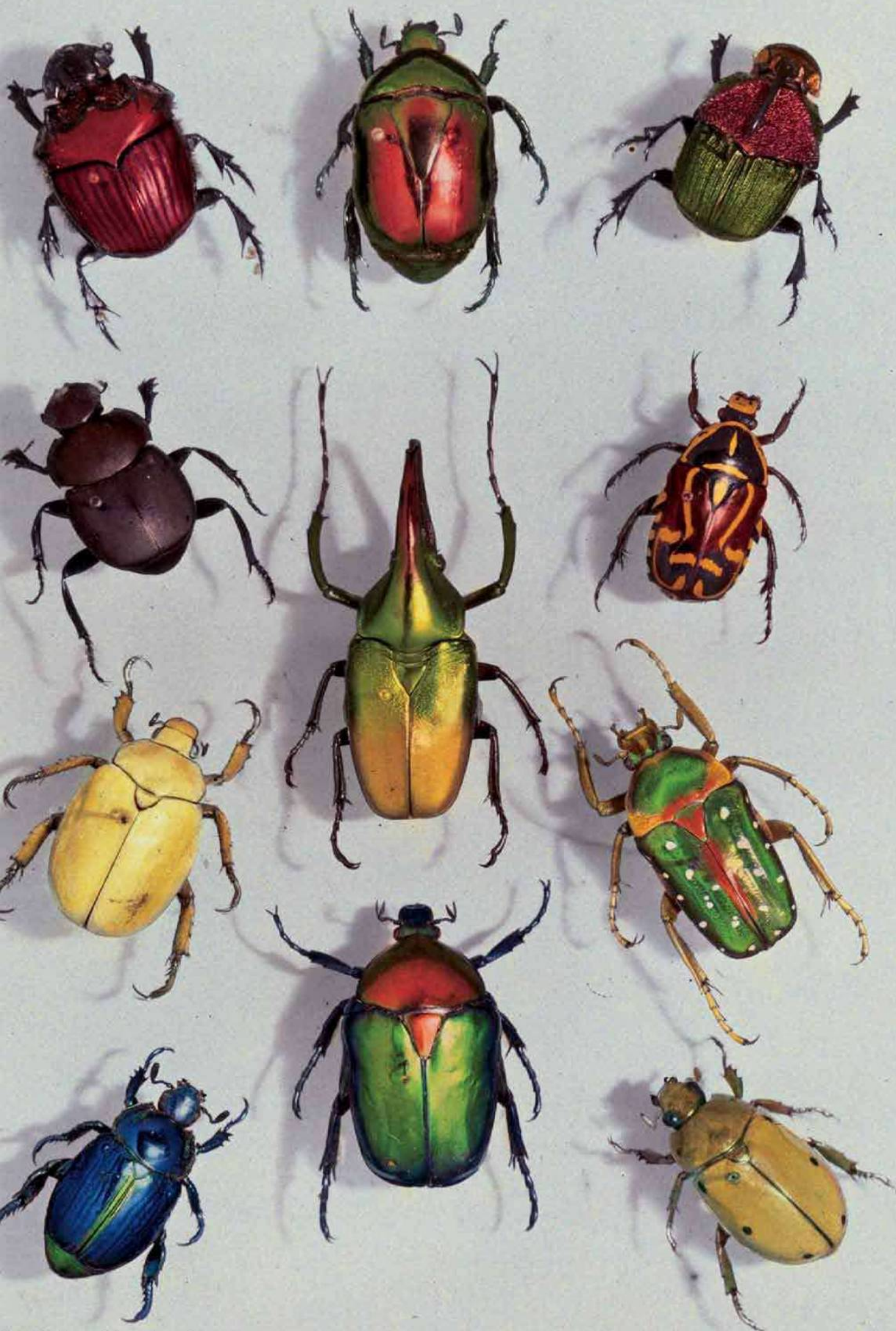
Ocean



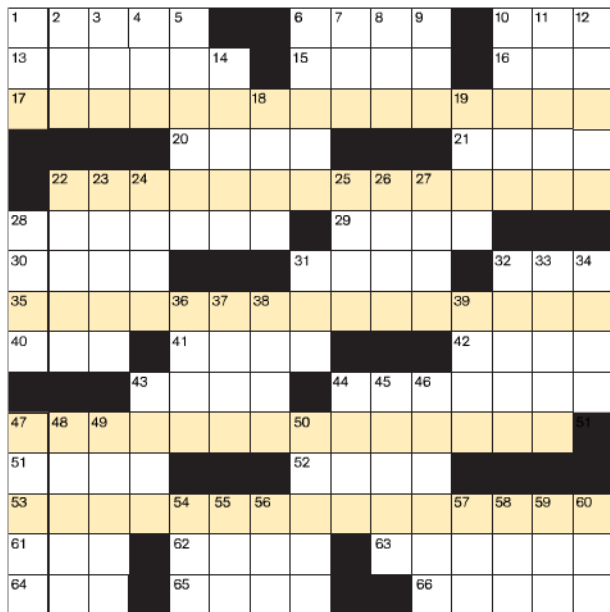
NATIONAL
GEOGRAPHIC

Meet the Beetles “Scarabs that might have made a pharaoh envious” were among 263 insects photographed for the July 1929 *Geographic*. They were first “placed with care in relaxing jars (a sort of humidior) to render flexible their delicate legs, wings, and antennae, so that they might be ‘posed’ in lifelike attitudes,” notes the accompanying text. “Their irreplaceable value...and the fragile nature of their many anatomical members added materially to the sense of responsibility of the members of the National Geographic Society’s illustrations staff.” —Margaret G. Zackowitz

PHOTO: EDWIN L. WISHERD, NATIONAL GEOGRAPHIC STOCK



GEOPUZZLE



ACROSS

- 1** Woody Allen pseudo-documentary
6 Feeling no pain
10 Fla. neighbor
13 Flared skirts
15 Pisa is on it
16 Card table shout
17 With 22 and 35 Across, lines 1 and 2 of an original verse about a new DNA discovery
20 Ancient Greek portico
21 Fried on both sides
22 See 17 Across
28 Kuala Lumpur native, e.g.
29 Numbered composition
30 Designer von Fürstenberg
31 Touched down
32 Prefix meaning atmosphere
35 See 17 Across
40 It makes kin kind?

- 41** Lapse
42 French Riviera resort
43 Grandson of Adam
44 Alternatives
47 With 53 Across, lines 3 and 4 of the verse
51 ___ cloud, theoretical sphere of comets
52 Vaulted church recess
53 See 47 Across
61 We're in the Cenozoic one
62 Street-fleet member
63 Washington city near Mount Rainier
64 Caustic solution
65 Neat freak's bane
66 Full of chutzpah
19 AAA jobs
22 The __, Dutch seat of government
23 Tie the knot on the lam
24 Verbal storm
25 Blessed
26 Grand-scale tale
27 Judges' follower, or a judge Bill appointed
28 Knit, as broken bones
31 European peak
32 Friends, in Firenze
33 Roast host
34 Bar or bakery shelfload
36 "Say it __ so!"
37 Baseball's Moisés, Felipe, Matty, or Jesús
38 What a shopper may consult
39 Basic element
43 "¿Cómo __ usted?"
44 Heads: Italian
45 Brazen type
46 Like the Broadway show *Tru*
47 White sale item
48 White with old age
49 Constellation bears
50 "Sir" in colonial India
54 Those of Columbo's rank: abbr.
55 "Erie Canal" song mule
56 Losing tic-tac-toe row
57 Instrument played by Don Ho
58 Bygone Russian space station
59 Year Pope Benedict XVI was elected
60 Woo-hoo!

DOWN

- 1** Drummer Starkey, Ringo's son
2 Yalie
3 Vietnam Memorial architect Maya
4 Gerund maker
5 Manages to make ends meet
6 Tears into
7 Nest egg for one's sr. years
8 Serengeti antelope
9 Darlin'
10 Plant source of tequila
11 LP jacket
12 Tennisist who married Brooke, then Steffi
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Click here for the answers.

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Smoke rises from surface oil being burned in the Gulf of Mexico.

PHOTO: JOEL SARTORE

October 2010

Special Report: Gulf Oil Spill

Is another deepwater disaster inevitable?

Seafood Print

Find out why a sardine sandwich is better than a tuna roll.

Australia's Lost Giants

Jumbo kangaroos and ten-foot-tall birds once ruled the land.

Jane Goodall

Her 50 years of work have made us rethink chimps.

Allard's West

Photos capture a world of cowhands and clouds.